

SOUTH GRAND BOULEVARD: **user orientation as a catalyst for resiliency**

by

JONATHAN MICHAEL RYAN

A REPORT

submitted in partial fulfillment of the requirements for the degree

MASTER OF LANDSCAPE ARCHITECTURE

DEPARTMENT OF LANDSCAPE ARCHITECTURE / REGIONAL & COMMUNITY PLANNING
COLLEGE OF ARCHITECTURE, PLANNING & DESIGN

KANSAS STATE UNIVERSITY
Manhattan, Kansas

2011

Approved by:

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LAURENCE A. CLEMENT, JR., J.D., ASLA

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2011

Abstract

Contemporary design of the urban environment focuses increasingly upon the quality of space found within the public right-of-way. Landscape architects and urban planners are beginning to ask new questions that deviate from the conventional streetscape designs of the latter half of the 20th century. Under the mantra “complete the streets,” communities all across America are calling for a paradigm shift towards multimodal, pedestrian-scaled urban rights-of-way. At the same time, existing stormwater and combined sewer infrastructure is nearing the end of its productive lifespan in cities all across the country and world. The direct costs associated with repairing this infrastructure combined with the indirect costs of poor water quality and a greater frequency and intensity of flooding events downstream present a strong argument for developing new, innovative ideas about how to best design the stormwater infrastructure of tomorrow.

The reintegration of ecological processes into the urban fabric will act as a catalyst for the appreciation of *genius loci* (spirit of the place) and user meaning while mitigating downstream flooding, increasing water quality, and extending the lifespan of existing stormwater infrastructure. By studying the hierarchical categorization of urban rights-of-way according to increased levels of user orientation, this research project aims to clearly articulate a new theoretical framework for expanding upon the current discourse surrounding “complete streets” and “green streets” theory.

In the long-term, it is both economically and socially profitable for cities to use ecological processes to reclaim auto-oriented, urban rights-of-way as valuable public space for the health, safety, and welfare of all their users.

SOUTH GRAND BOULEVARD

user orientation as a catalyst for resiliency



Jonathan Michael Ryan
Kansas State University
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2011

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Abstract

Contemporary design of the urban environment focuses increasingly upon the quality of space found within the public right-of-way. Landscape architects and urban planners are beginning to ask new questions that deviate from the conventional streetscape designs of the latter half of the 20th century. Under the mantra “complete the streets,” communities all across America are calling for a paradigm shift towards multimodal, pedestrian-scaled urban rights-of-way. At the same time, existing stormwater and combined sewer infrastructure is nearing the end of its productive lifespan in cities all across the country and world. The direct costs associated with repairing this infrastructure combined with the indirect costs of poor water quality and a greater frequency and intensity of flooding events downstream present a strong argument for developing new, innovative ideas about how to best design the stormwater infrastructure of tomorrow.

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In the long-term, it is both economically and socially profitable for cities to use ecological processes to reclaim auto-oriented, urban rights-of-way as valuable public space for the health, safety, and welfare of all their users.

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Lastly, I am thankful to my wife and family for their continued excitement and loving support throughout the duration of my collegiate education. Whether I was atop the “mountain” or in the “valley” below, these special people have always cheered me on in my pursuit of excellence.

To Kimberley

Introduction

design process

Nearing the end of my collegiate experience at Kansas State University, I have come to the conclusion that the most important lesson or skill that I could develop as an up and coming designer is the ability to internalize my design process and therefore be able to communicate it to others. This ability has been extremely crucial throughout the duration of this project as I have been responsible for all decisions on where my project is to go and in what form and degree of articulation it would be submitted to various audiences.

Figure i is intended to abstractly illustrate my design process when tackling projects of various scales and scopes. I do not begin with an empty vessel or blank canvas. Rather, I bring with me my design philosophy, inspirations, interests, experiences, knowledge, theoretical conceptions, and skillsets. Mixing in additional components such as an ongoing review of literature, project specific information, metrics for evaluation, and many other items, I begin my design process by clearly defining my dilemma and thesis. In contrast to the linear progression of the other four stages of my process, the definition stage is highly cyclical. Before settling on a set course for a project, it is necessary for me to explore all of the options. Many ideas are quickly brainstormed and explored allowing me to discard some ideas, generate others, and in the end select a specific direction by which I can narrow the project focus even further. In addition to the dilemma and thesis, the outputs of the project definition stage include the articulation of project goals, design goals, and personal goals coupled with a number of key questions to guide the work done in later stages.

Once having established a clear dilemma and thesis, the remainder of my process is largely linear allowing time to cycle back to previous stages for critical review of the inputs and outputs of a particular stage in relation to the project as a whole. During the investigation stage, I begin by continuing to gather existing knowledge pertinent to the project scope and direction assigned in the project definition. Next, I proceed to develop methodologies with specific approaches

and criteria for how to adequately use precedents and a site inventory and analysis to extract information necessary to design a site-specific project. Following the development of these methodologies, both written and diagrammatic in nature, I proceed to execute the precedent analysis and site analysis respectively.

While represented in a more nominal role in the overall process diagram, synthesis, the third stage, is the crucial link between a clearly defined project description and associated site analysis and the subsequent design applications. Through looking at the project's program elements, I am able to connect specific site analysis questions to initial design concepts in the application stage.

Four subtasks compose the application stage of my design process. Beginning with the conceptualization of several alternatives, I momentarily deviate from the overall linear process to readdress information learned throughout the investigation and synthesis stages. There are typically several cycles in this subtask before selecting one or two schematic designs to develop in greater detail. Eventually one concept is selected and refined to a level of my personal satisfaction. Once refined enough, I will begin the production of final graphics, text, and an outline for the project's oral presentation.

The final stage in my design process is evaluation. While a surge of energy is devoted to outputting the end products of the application stage, I strive to attain one last step, one wherein I believe the greatest potential for new knowledge and growth can take place. During this stage, I first apply the metric developed or adopted during the investigation stage to the final design proposal. I seek to learn how the design proposal matches up to the selected design criteria. Were my efforts a success? If not, what could I have done differently had I more time or another opportunity? In addition to evaluating the design in terms of a metric, I seek to evaluate it on some level of a cost-benefit analysis. I believe that being able to quantify evidence in support of the project's success establishes credibility for me as a landscape archi-

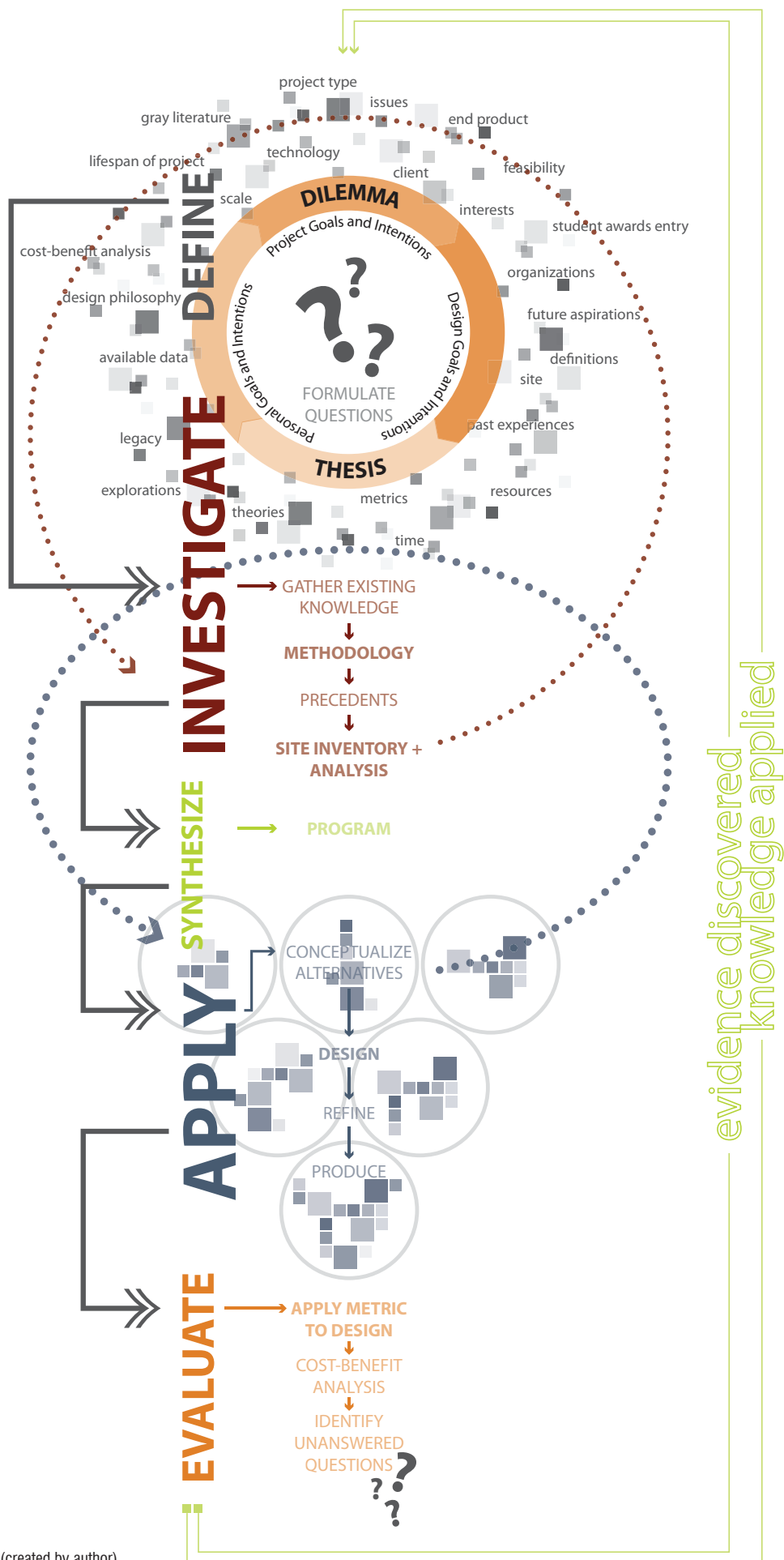


Figure i: Design process diagram. (created by author)

tect amongst other design professions and decision makers. Before considering the project complete, I find that it is important for me to identify any and all unanswered questions posed during the project definition stage. In this way, I synthesize what I accomplished and how well I accomplished it posing unresolved questions that I could easily reference at a later time for further investigation and subsequent project endeavors.

project timeline

Essential to this project's success in meeting all intermediate and final deadlines was the establishment of a timeline with key milestones, allotted time for individual tasks, and important course and university deadlines (see Figure ii). The project timeline directly corresponds with the stages and tasks delineated in the process diagram. The allotted time of focus for each task is expressed with darker circles oriented horizontally. Lighter circles signify a secondary time of emphasis for the given task. Vertical lines represent the project milestones and deadlines. The more important the deadline, the bolder the vertical line is represented. External events that ran concurrent to project tasks are delineated on the timeline as vertical box outlines.

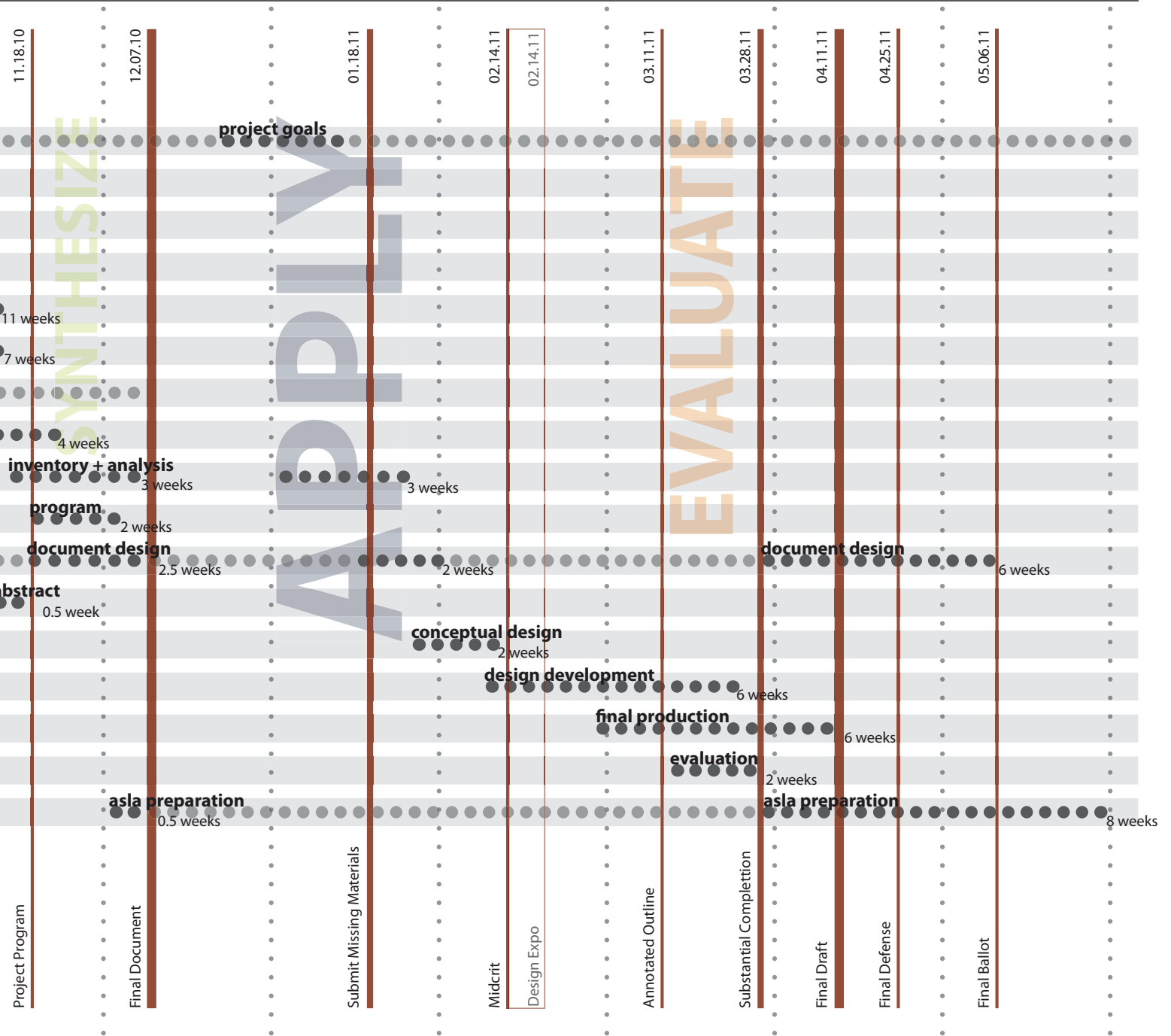
As a student representative of the Design Expo / Mock Interview Committee, I was responsible to fulfill certain obligations around planning events and inviting potential employers to those events. During the fall 2010 semester, the planning and preparation of Mock Interviews put me a couple of weeks behind. By having a timeline, I knew where I could adjust the allotted time for individual tasks allowing me to catch up for the start of the spring 2011 semester.

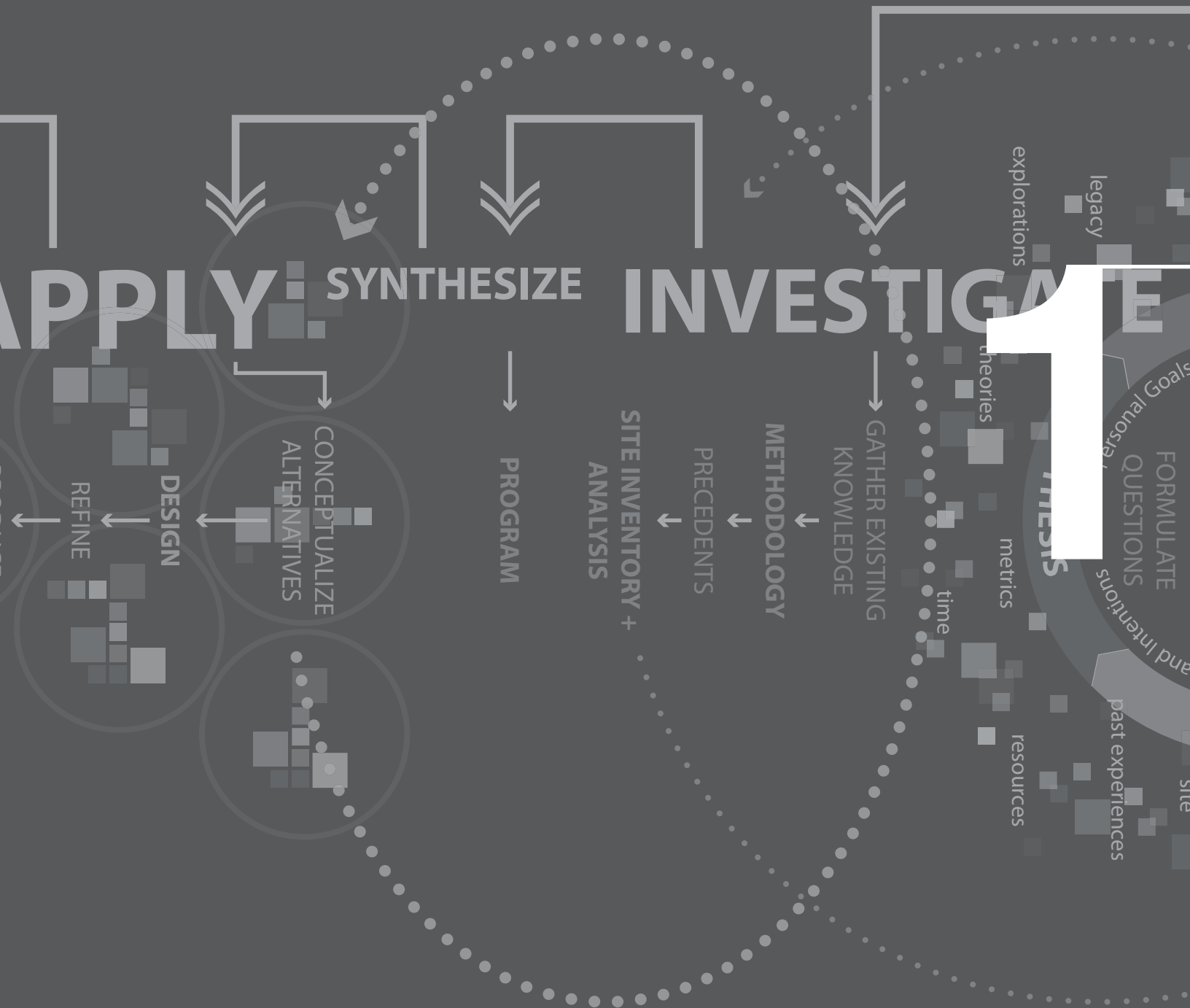


Figure ii: Project timeline. (created by author)

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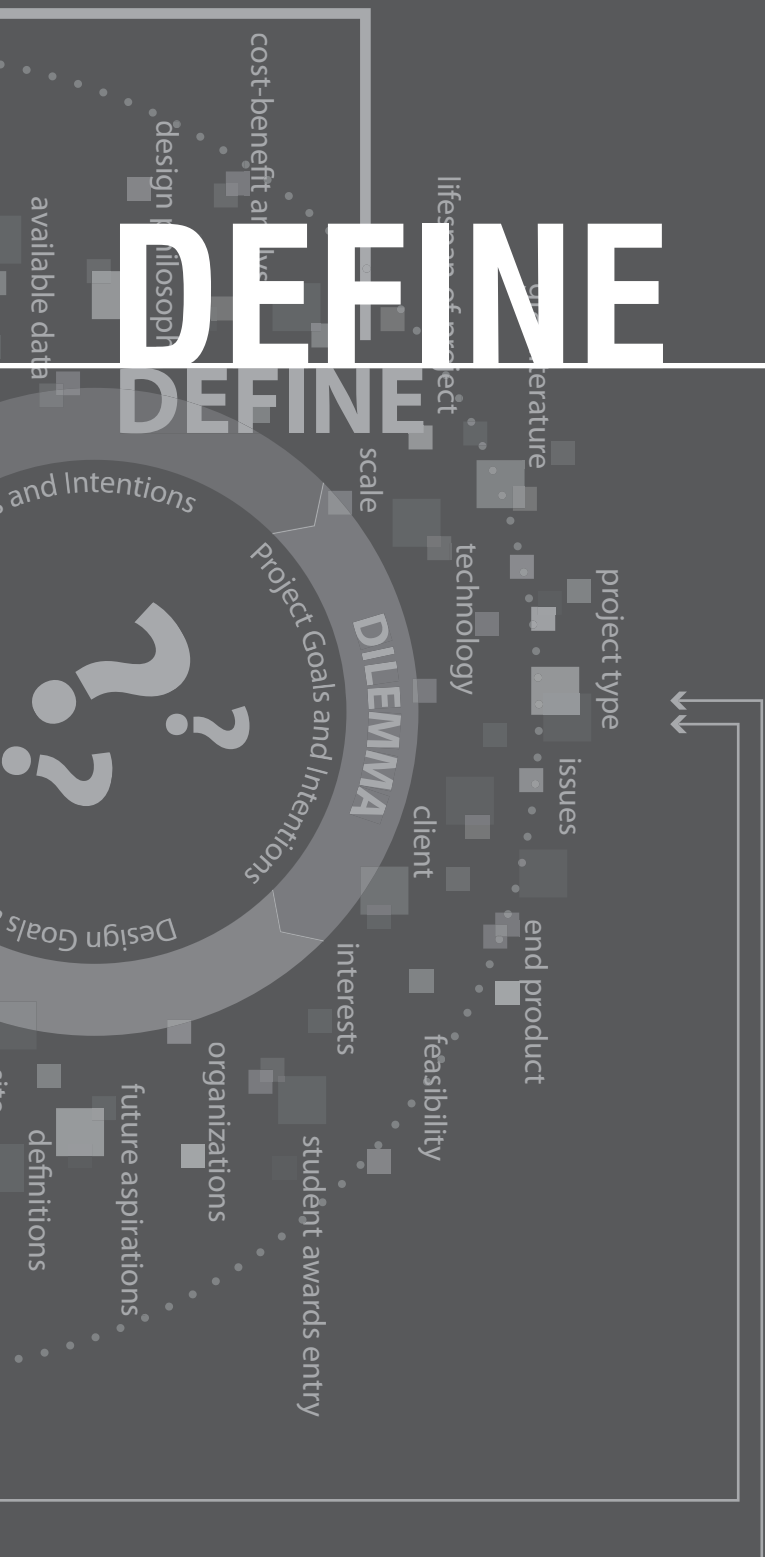
September December January February March April May



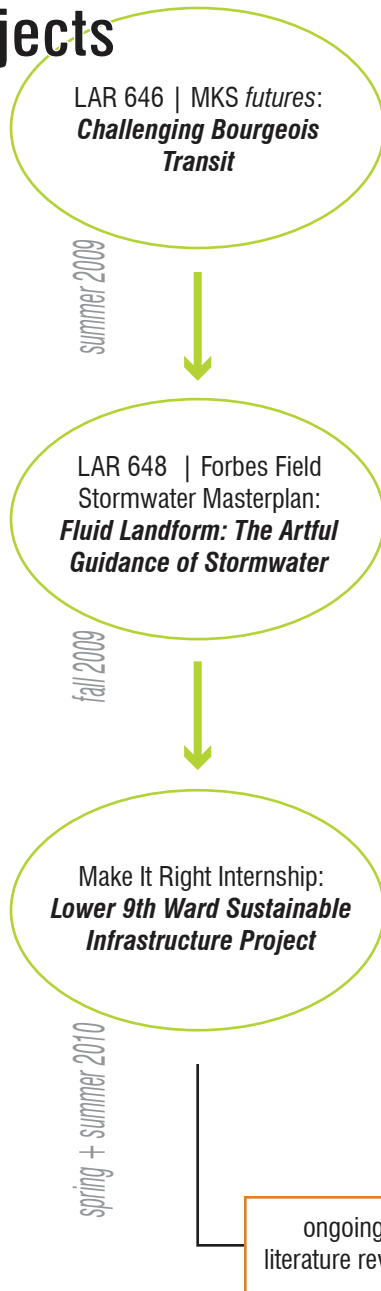


evidence discovered
knowledge applied

DEFINE

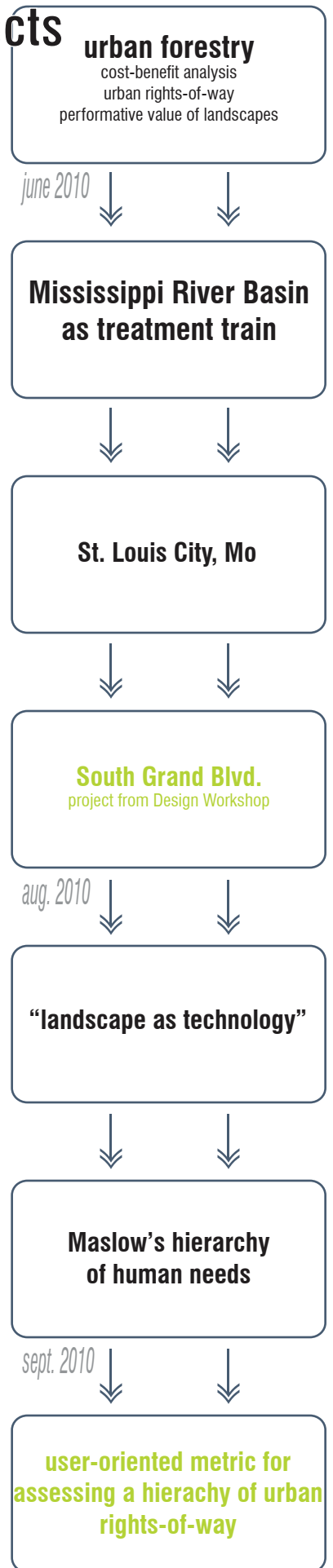


projects



initial project definition

subjects



... narrowing of focus ...

Figure 1-1: Project genesis diagram. (created by author)

Project Genesis

Many students in the landscape architecture program typically use real projects from firms in which they had worked during their extended internships as a basis for their master's project and report. In contrast, I began this process with no specific project or site in mind. The focus of this project evolved over the course of several months extending from my involvement with three projects, two within design studios and one throughout my extended internship. Figure 1-1 and the text below record how the project and theoretical framework presented in this document came to be. The text briefly covers the scope and focus of each project and how they influenced my desire to address the dilemma of aging stormwater infrastructure within urban rights-of-way.

In order to fully understand the genesis of *South Grand Boulevard: user orientation as a catalyst for resiliency*, one must return to my group's project submittal for the summer 2009, *MKS futures* studio. After studying the city of Manhattan, Kansas, at varying scales and parameters for four weeks, my group was tasked to frame a project dilemma to focus on for the remainder of the semester. Our project, entitled *Challenging Bourgeois Transit*, engaged in rethinking the city's transportation systems within its existing rights-of-way. Rather than allowing transportation engineers to make design decisions based solely upon peak volumes of motor vehicles, we proposed a reclassification of streets based upon their multimodal potential for all users of the site. The most important idea that I took away from this project was the idea that the right-of-way can become a testing ground for new innovative ideas that catalyze development upon adjacent properties.

Following the summer studio, I returned to school in the fall selecting to take a specialization studio focused upon the relationship between landscape and art. For the final project of the semester, my group elected to take on the design of an artistic stormwater master planning effort at Forbes Field Air National Guard Base located in Topeka, Kansas. Tasked to submit a proposal that incorporated the new federal base security buffers around buildings, our proposal included

two ambitious design concepts. First, we day-lighted a portion of the stormwater infrastructure that ran through the campus part of the base. Second, with the excess fill, we designed large, geometric berms that not only shielded the buildings from potential vehicular attacks but also unified the northern and southern portions of the base. In this way, we married the benefits of artistic expression and sustainable design practices into one innovative solution. In the end, we technically graded our proposal to show its feasibility and balance of earthwork. This experience was the first project where sustainable stormwater management truly became a passion in my work.

While working for the Make It Right Foundation in New Orleans, Louisiana, I had the opportunity to be involved with the *Lower 9th Ward Sustainable Infrastructure Project*. This final and most influential project offered me the chance to combine my interests in right-of-way design and stormwater management. The scope of the project consisted of designing new stormwater infrastructure for an eight-block area in the Lower 9th Ward. Intended to be a pilot project for the city of New Orleans, the project is to be constructed and monitored for up to three years in order to determine the overall effectiveness of the stormwater BMPs. If proven to be successful, the city will implement these sustainable design strategies on future right-of-way projects. For the duration of my involvement, I worked predominantly on the site design and construction detailing of the ground surface pavements and BMP designs.

Taking the knowledge gleaned from these projects coupled with a preliminary review of the relevant literature, I wrote an initial design research statement toward the end of June 2010. In its infancy, my project resided in the realm of urban forestry looking at the performative values of our cities' street tree populations. I was inspired by the lack of attention that designers and city officials are currently placing upon urban forests. After living in New Orleans for 7 months, I came to the realization that people living there have to put up with the

negative effects of “out-of-sight, out-of-mind” cities further upstream. The negative effects of larger volumes of floodwaters and poorer water quality levels are passed down as each and every northern city from Baton Rouge, Louisiana, to Minneapolis, Minnesota, simply collect, convey, and discharge their stormwater runoff into the river as if it were a means to the end of their problems. As a result, I began to ask the question: what would a plan for the Mississippi River Basin look like if you considered each city’s urban forest as a component of a larger treatment train for increasing levels of stormwater infiltration into the subsurface soils and improving water quality levels? The tree species selected in each urban forest would be specific to the city’s region and address the toxins that the city contributes to the river. For instance, Minneapolis could focus upon cultivating an urban forest designed to absorb the high amounts of salts used in deicing its roadways. On the other hand, St. Louis could focus upon building an urban forest that absorbs many of the heavy metals existing in the roadways. So on and so forth.

Realizing that I am only one person with a limited amount of time to complete my work, I decided that narrowing this large topic would be beneficial to both my developing passion for site scale, urban design and my desire to complete a project within the city of St. Louis, Missouri, a place in which I call home. Furthermore, my research informed me that St. Louis is currently not progressively pursuing “green street” design strategies within its urban rights-of-way.

Not wanting to design an urban forest master plan for the city, I decided to find a project that was similar in scale to the sustainable infrastructure pilot project in New Orleans. Toward the end of August 2010, I read a newspaper article mentioning the selection of Design Workshop, a landscape architectural firm out of Aspen, Colorado, as the lead designer for one of four demonstration projects underneath the *St. Louis Great Streets Initiative*. The site was located along South Grand Boulevard, a major north-south arterial for the city. Further-

more, the adjacent property to the site included a historic district that planners envisioned as more of a destination and place rather than a pass through for hurrying motorists. Convinced of the appropriateness of the project and site location, I contacted Paul Squadrito, Design Workshop’s project manager, asking for permission to use some of their research and base materials for my research project efforts. He agreed after I wrote a letter to the client, the East-West Gateway Council of Governments, explaining my intentions and the end goal of my research project. The client gladly accepted allowing me to gather valuable base data and information from the firm.

Though I had significantly narrowed the focus of my research project to the point of having a real project and site, I was still largely thinking about the performative aspects of urban forests and other ecological components. From my ongoing literature review, I became consumed with the idea that most landscape architects and urban planners are not thinking of street trees as anything more than aesthetic greening elements of the streetscape. Placed in small, planter “coffins,” many of these trees fail to live long, productive lives. Instead, they die out after ten to fifteen years of confined growth. At this point, I further investigated the benefits of green over grey infrastructure concluding that the idea of “landscape as technology” was the key to more resilient streetscapes. My ideas turned to redefining how we view the urban landscape. Street trees become pumping stations for absorbing and evaporating stormwater runoff. Rushes and other wet tolerant plant species placed within properly designed stormwater infiltration planters can act as filters for heavy metals and allow for increased stormwater infiltration into the soil.

In discussing with a studio professor the scope and makeup of my project, I was abruptly told that I did not yet have a Master’s level project defined. I left this meeting feeling completely crushed, not knowing which direction to take my project next. After spending the weekend processing a multitude of potential directions, I unex-

pectedly stumbled upon an epiphany during a class discussion in my Business and Professional Communications course at K-State. During this particular class period, the instructor was leading a discussion on the impact of Abraham Maslow's "Hierarchy of Needs," a theoretical framework that examines human motivation, upon the management philosophy of large corporations and businesses in America. I learned of how his hierarchical ranking of human needs helped business managers and supervisors understand how to cultivate environments that responded to higher levels of human needs with the outcome of more productive workers. Immediately during class, I began to think about my project and how I am interested in designing urban rights-of-way that are increasingly more productive. Literally within a few moments, my mind raced with ideas of how I could hierarchically rank urban rights-of-way based upon their associated levels of user orientation. I asked myself the question: how could landscape architects design streets in a way that would do more for people than just allow them to commute from one location to another? The answer has become the focus of this document. By articulating a hierarchy of user-oriented streets, I seek to provide designers a way of evaluating their projects and inform them of what is required to obtain higher levels with greater returns for their dollar and time in the long-term. In this way, I seek to expand upon the current theoretical discourse surrounding "green street" and "complete street" theories.

As previously stated, the genesis of my project is quite unique in comparison to what I have observed in the past from former students in my program of study. Though it took several months to fully define and understand my project, I take pride in the fact that I conceptualized this project and suited it to meet the research interests and passions of my development as a designer. I learned the value of cyclical thinking and the importance of an ongoing review of literature. Most importantly, I learned to never be too attached to one idea that you could not slightly redirect for a far better and more rewarding idea and project.



Figure 1-2: Existing street trees are sparse in some areas. (photographed by author)



Figure 1-3: View of a bicycle chained to a parking meter indicative of the absence of bike parking. See also the constricted soil conditions that the street trees must grow within. (photographed by author)

Dilemma

Contemporary design of the urban environment is increasingly focused upon the quality of space found within the public right-of-way. Landscape architects and urban planners are beginning to ask new questions that deviate from the conventional streetscape designs of the latter half of the 20th century. Under the mantra, “complete the streets,” communities all across America are starting to call for a paradigm shift towards multimodal, pedestrian-scaled urban rights-of-way. A look back at the past 50 years reveals an auto-oriented design philosophy that failed to design for alternative modes of transit and placemaking. The next 50 years hope to foster a new ethic towards “complete street” design where pedestrians, cyclist, transit riders, and motorists all have the equal opportunity to enjoy their surroundings and move efficiently from one place to another.

While more and more literature on the design of sustainable “complete streets” appears in professional and academic journals, landscape architects and urban planners fail to recognize the final component, stormwater conveyance. Existing stormwater and combined sewer infrastructure is nearing the end of its productive lifespan in cities all across the country and world. The Environmental Protection Agency (EPA) forecasts up to 75,000 sewer overflows each year in the United States, resulting in a total discharge of 3-10 billion gallons of untreated wastewater into our streams, rivers, lakes, and reservoirs (Addressing 2007). Additionally, the cost and frequency of repairs to

current infrastructure will only increase in the years to come. Just as engineers have historically designed streets for efficiently moving peak volumes of vehicles, stormwater sewers have been designed for the quickest, most efficient collection, conveyance, and discharge of stormwater from urban areas to locations further downstream. As evidenced in recent decades, flooding is increasing in both frequency and intensity driving up the economic and environmental costs of ignoring natural processes (Fremling 2005). As the EPA is calling for innovative design solutions and technologies to address the aging infrastructure problems, landscape architects and urban planners are poised to rethink systems and policies that could change the infrastructure model for the next 100 years of construction.

In early 2006, the East-West Gateway Council of Governments introduced the *St. Louis Great Streets Initiative* with the goal of promoting “complete street” design principles in St. Louis, Missouri. South Grand Boulevard, selected as one of four pilot projects, seeks to be a demonstration project for socially and economically sustainable streets in the region; however, current concepts for the streets are not progressing far enough towards providing a model of future infrastructural design. With the allocation of \$2.7 million of federal stimulus money towards the project, a huge opportunity presents itself for integrating new forms of green infrastructure into the design proposal (Sustainable 2009).



Figure 1-4: View of cyclist putting pedestrians in harm’s way while riding his bicycle on the sidewalk as a result of no designated bike lanes. (photographed by author)



Figure 1-5: View of three local users of the right-of-way who do their best to find a place to sit down and rest. (photographed by Richard Ziegler)



Figure 1-6: Multi-story residential buildings along South Grand Blvd. between Humphrey St. and Utah St. (photographed by Richard Ziegler)

Thesis

Through the strategic fusion of ecological processes into the urban fabric, the design of South Grand Boulevard will present a resilient model for how “advanced infrastructure” design can transform urban rights-of-way from functional “leftover spaces” toward meaningful “user-oriented” environments. While the introduction of ecological processes into the urban environment is not a new idea within the profession of landscape architecture, this report presents a framework that explains how and when ecology should be introduced if it is to be accepted by the users and remain for the long-term.

key questions

- Can a city truly be resilient in the 21st century without major overhauls in how it constructs, maintains, and replaces its infrastructure?
- How can ecological processes be reintegrated into “conventional” stormwater conveyance and treatment processes located in urban rights-of-way?
- How can we design performative urban landscapes that serve specific stormwater related functions while fostering *genius loci* and user ownership?
- What does a design framework look like for hierarchically ranking urban rights-of-way according to how well they respond to their users?



Figure 1-7: View of narrow sidewalk conditions along South Grand Blvd. (photographed by author)

Goals and Intentions

project

- Achieve a high standard of excellence in all written, graphic, and verbal representations of my work.
- Create an end product that pushes the bounds of modern stormwater design within urban rights-of-way.
- Understand how conventional, combined stormwater sewers handle water collection, conveyance, and treatment.
- Submit the theoretical investigations and design concepts within this report to the American Society of Landscape Architects 2011 Student Awards Competition.
- Redefine the hierarchy of urban rights-of-way based upon their ability to respond to all users rather than their efficiency at moving automobiles.
- Incorporate some form of a cost-benefit analysis for the design proposal arguing for its validity.
- Develop a clear metric for assessing the resiliency of urban rights-of-way in order to evaluate “green street” precedents and the final design proposal.

personal

- Utilize this project as the capstone piece of my academic work within a new portfolio.
- Balance the progress of this project with other personal, academic, and extracurricular activities.
- Advance my skills in the representation and oral communication of my ideas.
- Increase my knowledge and understanding of St. Louis, Missouri, a place in which I call home.

design

Function

- provide **efficient movement** for vehicular users
- incorporate existing **stormwater infrastructure**
- protect **limestone foundations** of buildings

Safety

- provide a **positive**, physical **environment** for users
- **prevent injury** or harm among all users
- promote **equality of experience** for all users

Ecology

- incorporate a **cost-benefit analysis** of street trees
- reduce the **carbon footprint** of urban right-of-way
- **treat stormwater** runoff on-site

Genius Loci

- create a **progressive identity** in the regional market
- engender a distinctive, **ecology driven** district
- develop the district as a “**community of users**”

Meaning

- cultivate motivated “**dynamic users**”
- foster **user ownership** of the urban right-of-way
- promote a “**user land ethic**”



Figure 1-8: View of outdoor dining that takes advantage of the larger setback on the west side of South Grand Blvd. from Juniata St. to Connecticut St. (photographed by author)



Figure 1-9: View of existing outdoor dining that constricts pedestrian circulation. (photographed by author)



Figure 1-10: View of the residential character along the southern portion of the project site. (photographed by author)

Project Information

location + size of site

- St. Louis, Missouri
- Six-block area of South Grand Boulevard extending from Arsenal Street to Utah Street
- Right-of-way dimension: approximately 80' in width



Figure 1-11: Project site located along South Grand Blvd. from Arsenal St. to Utah St. (base imagery provided by Bing Maps; graphic created by author)

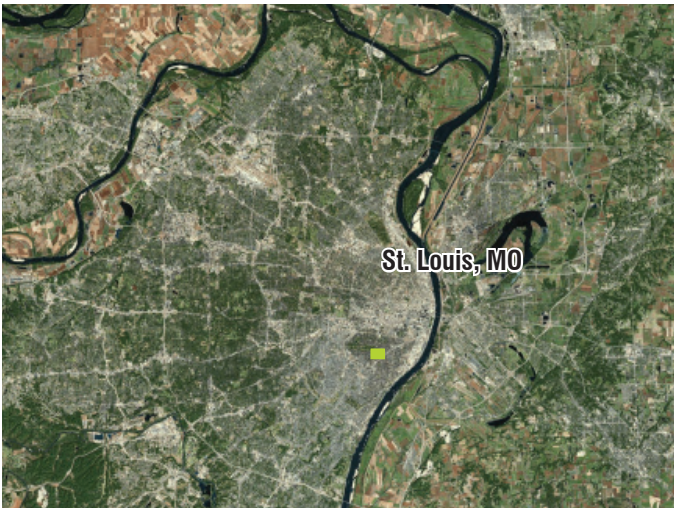


Figure 1-12: Regional metropolitan scale. (Bing Maps)

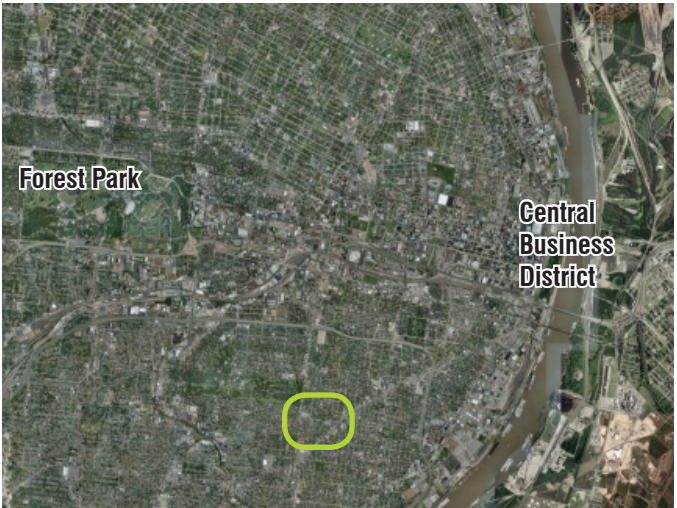


Figure 1-13: City scale. (Bing Maps)

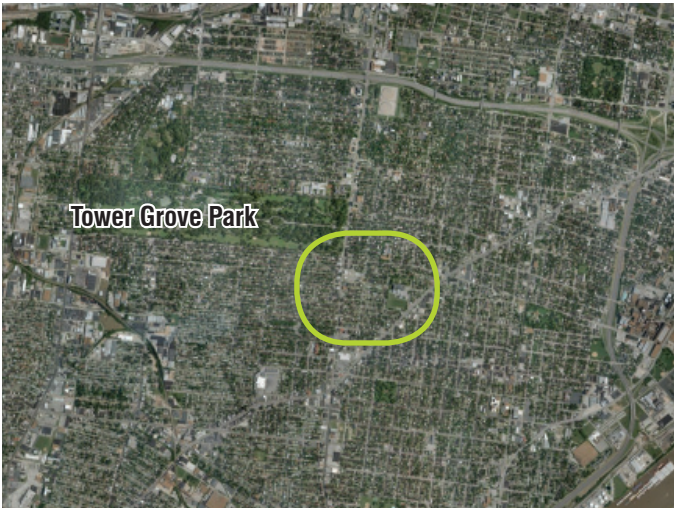


Figure 1-14: Neighborhood scale. (Bing Maps)

critical existing site conditions

In 2008, the *St. Louis Great Streets Initiative* identified six critical existing obstacles that prevent the six-block area along South Grand Boulevard from becoming a “great street.” The noted obstacles were high vehicular speeds, a mobility-focused arterial corridor, lengthy pedestrian crossing distances, a lack of sufficient pedestrian lighting, an inadequate supply of vehicular parking, and aging infrastructure. South Grand Boulevard exists as one of St. Louis’ primary north-south arterial corridors. High vehicular speeds averaging 45 mph foster an unsafe environment for pedestrians wishing to cross the street and cyclists wishing to travel alongside vehicles. In fact, during the first eight months of 2009, 80 accidents and one pedestrian death were recorded within the six-block area (Sustainable 2009). Pedestrians wishing to cross South Grand must travel a minimum of 56 feet between sidewalks. The limited supply of parking is a very critical issue to take into consideration. Community stakeholders do not wish to reduce the current vehicular parking capacity. In addition, motorcycles and bicycles are often observed to be parked on the sidewalks and chained to street trees, making it hard for pedestrians to maneuver around and enjoy a clutter free environment. The final design should incorporate both motorcycle and bike parking as design program elements. Each of these issues must be addressed within the design solution if the project site is going to become a destination and place rather than a pass through for motorists.

Conversations with Paul Squadrito, project manager from Design Workshop, have been extremely informative. He suggested reaching out to both the Missouri Coalition for the Environment and the Metropolitan St. Louis Sewer District (MSD) for more specific information about the state and condition of existing stormwater infrastructure. He went on to explain that the site’s stormwater infrastructure is aging at an accelerated pace and is currently under capacity for larger storm events. According to Paul, MSD is interested in long-term solutions that reduce the amount of runoff and economic burden of aging storm-

water infrastructure.

Paul identified two critical existing site conditions that affect increased water infiltration into the subsurface. First, many of the older buildings along South Grand Boulevard have limestone foundations. As a result, the city has been cautious about being liable for the effects of increasing subsurface water volumes around these foundations. Second, the high clay content of the soils will need to be researched and more than likely amended to achieve greater infiltration rates.

Lastly, a school for the blind is located directly north of the project site. Considerations for the safety and experience of people with visual impairments should be accommodated in the final design proposal.

program possibilities

Beyond the identification of six critical existing site obstacles, the *St. Louis Great Streets Initiative* surveyed local community stakeholders asking them to rank the importance of a number of potential program elements. The survey revealed that the community most valued a new design that focused upon the pedestrian environment. Parking, street upkeep, placemaking, and the motorist environment were other areas of interest ranked respectively from most to least desired. This invaluable community input provides a strong foundation for designing a project that accommodates the pedestrian while designing stormwater infrastructure for the future. **How can the introduction of ecological processes into an urban right-of-way spatially enhance a street for the pedestrian?**

Other program possibilities include the intentional design and incorporation of cycling amenities (parking, bike lanes, etc.) into the urban fabric. Site visits have revealed a number of bicycles being chained to trees or carried into residences as a result of no bike parking. In addition, one can easily catch a glimpse of the community’s interest in local artistic expression. Several artistic mosaics and paintings currently cover common utilitarian elements such as traffic signal boxes.



Figure 1-15: Intersection of South Grand Blvd. and Arsenal St. (Google imagery photomerged by author)



Figure 1-16: Intersection of South Grand Blvd. and Arsenal St. (Google imagery photomerged by author)



Figure 1-17: Intersection of South Grand Blvd. and Arsenal St. (Google imagery photomerged by author)



Figure 1-18: Intersection of South Grand Blvd. and Hartford St. (Google imagery photomerged by author)



Figure 1-19: Intersection of South Grand Blvd. and Juniata St. (Google imagery photomerged by author)



Figure 1-20: Intersection of South Grand Blvd. and Connecticut St. (Google imagery photomerged by author)





Figure 1-21: Intersection of South Grand Blvd. and Wyoming St. (Google imagery photomerged by author)



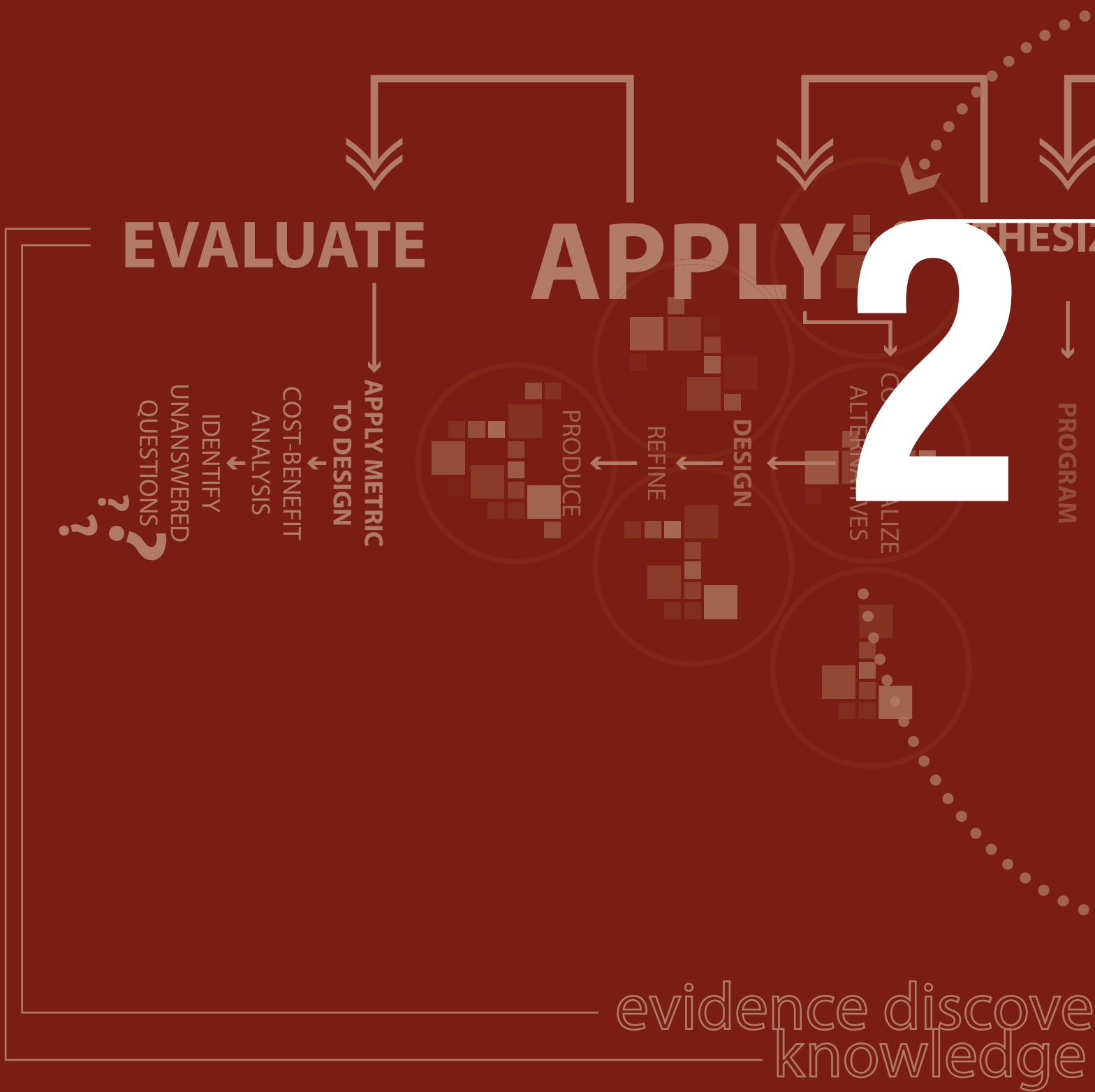
Figure 1-22: Intersection of South Grand Blvd. and Humphrey St. (Google imagery photomerged by author)



Figure 1-23: Intersection of South Grand Blvd. and Utah St. (Google imagery photomerged by author)



2

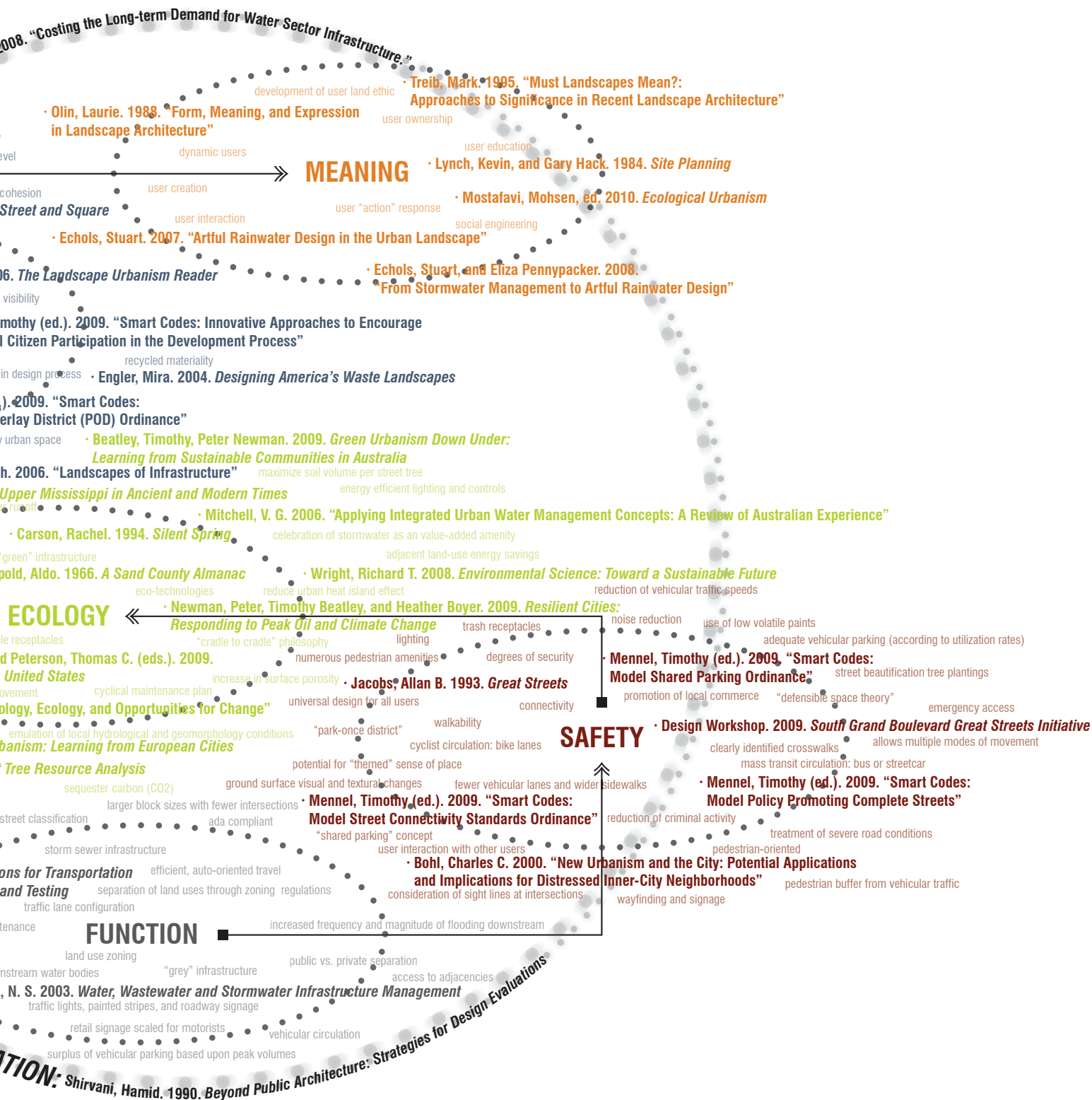


evidence discover
knowledge

INVESTIGATE



Figure 2-1: Literature map. (created by author)



hierarchy of user-oriented streets

The stated dilemma is both daunting in its complexity of inter-related parts and a blessing for the professions of landscape architecture and urban planning. These professions are approaching a season of harvest where the world is ripe for the acceptance of new ideas that creatively solve the problems associated with aging stormwater infrastructure. In the past century, the world turned to architects and engineers to create the urbanity we know today. Focused upon the creation of independent “objects,” the architects largely failed to consider streets as potential places of unique, social dynamism. William Whyte’s research concerning the design of public plazas within New York City is an excellent source for revealing the lack of attention placed upon the outdoor user environments of cities.

Of course, with cities full of independent structures, someone had to step in and offer expertise on how to design a network of inputs and outputs that would allow these buildings to function properly. Ironically, the leftover space that the architects cast away became the domain of the engineers. Driven by the pursuit of efficiency, these engineers designed the highly consumptive infrastructure model that we have today. Whether it is the movement of automobiles or the collection, conveyance, and discharge of stormwater, engineers seem to follow the motto “the bigger, the faster, the better.” The result is a highly functional urban right-of-way oriented toward the motorist. Design for pedestrians and other user groups is simply left out of the equation.

With the increasing economic burden of aging stormwater infrastructure, landscape architects and urban planners are poised to rethink the “leftover” spaces cast aside by architects and lead discussions with engineers on the potential for infrastructure to do more than meet the basic, functional needs of our society. Given the recent popularization of sustainability, it is no secret that the reintroduction of ecological processes into the urban fabric is a crucial element in solving the dilemma. However, the incorporation of ecology alone will not be enough to garner long-term public support or elevate streets to

their greatest potential.

Landscape architects and urban planners are currently leading street design movements associated with “complete street” and “green street” theories. While these isolated movements are important, the real question that we should be asking is how do these movements relate to one another, the existing urbanisms, and the design process in general? In other words, what does a framework look like for connecting the many disparities among contemporary urban design theories?

Innovation often comes through stepping outside the typical boundaries of the design professions to look at theories posed by other professions. As mentioned within the project genesis text, there is tremendous value in reaching out to an existing framework within the field of psychology. The following text presents a general overview of Abraham Maslow’s Hierarchy of Needs framework before introducing the proposed Hierarchy of User-oriented Streets framework.

Maslow’s Hierarchy of Needs Framework

In order to understand the importance of Maslow’s theory, one must return to the historical context surrounding the evolution of business organizational and communication models throughout the 20th century. Since the dawning of the Industrial Revolution, these models have undergone significant changes in their structure and philosophy. During the early 1900s, “scientific management” existed as the prevalent theory behind the organization of factories. Fredrick Taylor, an engineer, first defined this model upon the idea that “management was a true science that should be governed by scientific principles, rules, and laws” (Goodall and Goodall 2006, 35). He advocated for the standardized operation of factories and organizations that resembled “efficient machines.” As a result, workers were considered by their supervisors and bosses to be nothing more than “replaceable parts” of the larger factory machine. Sick and injured workers were easily replaced.

After observing many of the inhumane problems associated with

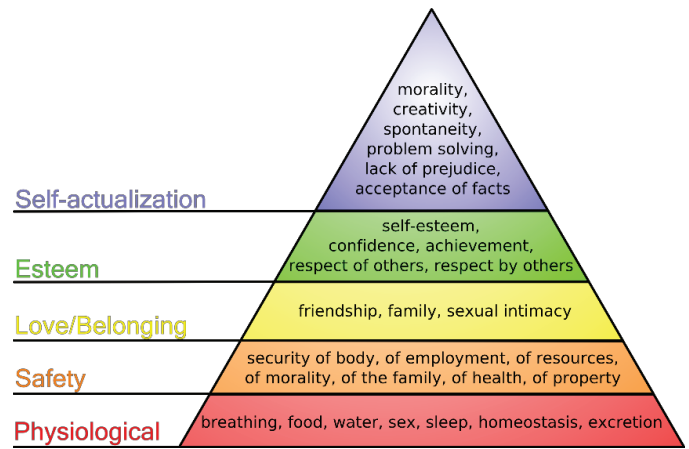


Figure 2-2: Maslow's Hierarchy of Needs framework. (http://thefreeman.net/journal/wp-content/uploads/2010/06/maslows_hierarchy_of_needs2.png)

the scientific management theory, Max Weber proposed that “standards of fairness” be incorporated into the business organizational models. He believed that the establishment of “bureaucracies would stamp out the harsh, inequitable, and often deadly conditions that arose from poor scientific management” (Goodall and Goodall 2006, 37). While a step in the right direction, Weber’s ideas failed to consider the possibility of increased worker productivity resulting from an environment of equitable communication and an ability to improve one’s status within the factory or organization.

With the arrival of the 1940s and 1950s, a psychologist named Abraham Maslow offered an unprecedented theoretical framework for hierarchically ranking the needs of human beings. Through his investigation of what motivates people to higher levels of productivity, he discovered that not all human needs are equal in importance. For instance, if you are both hungry and thirsty, you will likely put your first effort toward finding water and second toward finding a source of food. Similarly, if you are both thirsty and cannot breathe, you will instinctively pursue oxygen filled air before attempting to locate a water source. Of course, a need such as sexual satisfaction is far less important in comparison to the needs of air, water, and food. As your survival is not contingent upon getting sex, you will forgo any pleasure needs before the physical needs are fulfilled.

Building upon this theoretical trajectory, Maslow argued that all human needs can be categorized into one of five distinct levels: physiological, safety, belonging, esteem, and self-actualization. Physiological needs consist of the essential needs for sustained life such as air, water, food, and sleep. Once these physical needs are satisfied, one can enter into the next level of safety. Safety needs are those needs that provide a sense of security to someone. Specifically, safety needs include the security of one’s health, of employment, of resources, of family, and of adequate shelter. Until these needs are fully satisfied, one will not address the higher level social needs. Belonging needs consist

of friendship, group associations, family, and sexual intimacy. Once these low level social needs are met, one can begin to address esteem needs. Esteem needs can be further divided into extrinsic and intrinsic needs. Extrinsic needs include a desire for public recognition, respect of others, and social status. Intrinsic needs include one’s achievements, self-esteem, and confidence. Finally, Maslow argues that after all physiological, safety, belonging, and esteem needs are satisfied, self-actualization can take place. “Self-actualization is the summit of Maslow’s motivation theory. It is about the quest of reaching one’s full potential as a person. Unlike lower level needs, this need is never fully satisfied; as one grows psychologically there are always new opportunities to continue to grow” (Envision Software, Incorporated 2009).

Maslow’s hierarchy of needs framework has had a huge impact upon the business organizational and communication models within the workplace. From the time of its introduction to the present, his framework has successfully opened the eyes of many owners and managers as they come to the realization that simply providing a paycheck each week will only satisfy the lower-order needs. Furthermore, the provision of “proper training and educational opportunities [will] help satisfy their higher-order needs, thus making workers more productive” (Goodall and Goodall 2006, 39).

While seemingly unrelated to urban rights-of-way, Maslow’s framework offers a strong precedent for answering questions concerning increases in productivity. Over half a century later, the positive impacts of his theory are still accumulating to this day. As landscape architects and urban planners ponder upon the next generation of stormwater infrastructure design, perhaps they will find it useful to reference Maslow’s thought process and methods. The question we must ask ourselves is how can we apply Maslow’s understanding of what motivates human productivity to the creation of a new framework that allows us to identify and measure the productivity and resiliency of urban rights-of-way.

Presentation of Proposed Framework

Hierarchically ranking streets according to their level of user orientation provides landscape architects and urban planners a powerful tool for both evaluating where we currently are in the design and construction of urban right-of-ways and provide the roadmap for how we attain long-term resiliency. All urban rights-of-way can be classified into one of five overall levels of user-orientation: function, safety, ecology, genius loci, or meaning. Each level is unique from the others in purpose, targeted user group, associated program, and the amount of services rendered unto its users. Note, that while this framework is intended to be applied to any number of street types, sizes, and locations, the subcomponents under each level would likely change from one street to the next.

Figure 2-3 visually portrays the Hierarchy of User-oriented Streets framework. Function is the lowest level of user-orientation in which an urban right-of-way provides the most basic levels of service to users for their efficient movement from one point of reference unto another. Most streets in America exist within the function level. They meet the minimum requirements for what is needed to sustain daily traffic flows and the utilities required by adjacent land uses. Essential components that streets must have include paved roadway surfaces exhibiting few potholes, stormwater infrastructure sized to handle rare peak flow events, delineated vehicular lanes, roadway signage, and ADA compliant sidewalks. If an urban right-of-way does not meet these requirements, any attempt to increase user orientation will be futile.

Safety is the next to lowest level of user-orientation in which an urban right-of-way promotes equal opportunity and experience through the health, safety, and welfare of all users. A growing number of municipal street initiatives are promoting campaigns to achieve this level of user orientation where the urban right-of-way becomes a walkable, pedestrian-scaled environment for all user groups. Often these streets are characterized by their emphasis upon multiple modes of transit.

Consequently, design interventions can include a reduction in the number of vehicular lanes and/or speed of travel as bike lanes, bus stops, and streetcar/light rail lines are incorporated into the right-of-way. Balance is the ultimate goal. An urban right-of-way that supports multiple modes of transportation and activates the sidewalk as a space for social exchange without sacrificing its basic functional role successfully attains a high safety level of user orientation.

Ecology is the essential, median level of user-orientation in which an urban right-of-way reintegrates natural processes into the urban fabric through eco-technologies that promote healthier environments and an improved quality of life for the users. Intentionally positioned in the middle of the pyramid, ecology exists as a prerequisite for entering into the higher levels of genius loci and meaning. Street trees alone do not constitute the ecology necessary to enter into higher levels as they are often included within both function and safety level streets. In these applications, street trees are planted primarily to increase the aesthetic appeal of the corridor, not to serve any ecological service. Instead, the system-based incorporation of eco-technologies signifies the realm of true ecology. Eco-technologies are the applications of ecologically sensitive techniques, processes, activities, and/or structures into the existing urban fabric's grey infrastructure. Other components of the ecology level include the selection of native plant species, the emulation of local hydrological and geomorphological conditions, an increase in surface porosity, and the celebration of stormwater as a "value added amenity."

When introducing natural processes into the urban environment, it is imperative that one not jeopardize the users' safety. For instance, the inclusion of stormwater infiltration planters without some sort of safety curb could foster an environment where users, unaware of their surroundings, accidentally misstep falling into one of the planters. If users fear that harm could come to them or their children, they will reject the synthesis of nature and urbanity leading to an eventual regression of

the corridor's resiliency.

At other times, a designer must strive to somehow educate the users dispelling common misconceptions. One of the most typical misconceptions is that the eco-technologies will serve as optimal breeding grounds for mosquito populations. In reality, "most mosquito species require standing water for a minimum of 10 to 14 days to complete their development" (Virginia Department of Health 2008). So long as the system is properly maintained to completely drain within 48 to 72 hours, no such condition should ever exist. Until users daily encounter and therefore are more readily accepting of ecological processes in the urban right-of-way, creative educational ideas will be an important part of each "green street" project. The importance of this must not be overlooked as the remainder of the theoretical pyramid depends upon how well designers are able to introduce natural processes into urbanity. If people are apprehensive toward the eco-technologies, they will not desire to fund the necessary maintenance of these systems. Should this happen, the result will be a costly waste of space that fails to provide the desired ecological services due to a lack of user investment.

Genius loci is the next to highest level of user-orientation in which an urban right-of-way uses ecological processes through time to engender its distinctive character and unique identity toward a community of users. Streets within this level become regional destinations of place. Key components include local materiality, district cohesion, integration of the existing culture, artistic expression through public art, and local community engagement in the design process.

Having achieved the levels of function, safety, and ecology, an urban right-of-way can begin to address its regional visibility. As with any marketing campaign, knowing one's audience and selecting the appropriate message are two crucial factors in effectively selling the product. Before the proverbial pencil touches the drawing table, designers should ask themselves the following question: who am I trying

to attract to this place and what other districts are in competition? Knowing the answers to these questions will allow the designer to make strategic decisions about the overall aesthetics and form within the district.

While one should certainly not weaken the district's strong foundation through the arbitrary removal or alteration of lower order components, it is intended that all of these components and systems be revisited for better cohesiveness and site-specific design solutions. For instance, what was a concrete or prefabricated bench at the safety level may become granite or some other locality-driven material within the genius loci level. The central, underlying principle of the theoretical framework remains. If in revisiting the design, one disrupts the operation of a lower level, then the users of the site will not support the monetary or physical investment needed to reach or maintain a genius loci level of user orientation.

As such, the Hierarchy of User-oriented Streets framework answers the age old design question: which should come first, form or function? The framework clearly establishes function at the bottom of the pyramid and form nearer the top. Understanding this positional relationship will allow a designer to check his or her designer intentions with the idea that whatever the form, the urban right-of-way must always function.

Before presenting the meaning level, the significance of time must be addressed. The first three levels of the framework (function, safety, and ecology) can all be obtained through a single design intervention at any moment in time. This is not true for the final two levels: genius loci and meaning. Designers should not assume they have the ability to design either identity or meaning into a place. Instead, designers should look for opportunities to strategically stage environments for the potential creation of identity and meaning. User involvement through time is what will build both identity and meaning.

Meaning is the highest level of user-orientation in which an urban

right-of-way cultivates educated “dynamic users” who inherently take ownership of the public space and engage in actions that promote resiliency within the corridor. As with Maslow’s self-actualization level, there is no cap on the amount of growth that can occur in this level. One can always gain a deeper appreciation for and better understanding of the places in which they live, work, and play. Several key components within the meaning level include user education, “dynamic users,” user ownership, and the development of a “user land ethic.”

User education must take place if users are to ever become motivated cogs of the right-of-way advocating for resilient practices in the future design, construction, and ongoing maintenance of the urban and natural systems. Many contemporary “green street” projects incorporate some attempt toward user education through the placement of didactic signage. Users who take time to read the text gain knowledge about the ecological components in the right-of-way; however, this alone is not enough to cultivate “dynamic users.” Without experiencing a personal connection or interaction with the eco-technologies, they continue on their way without any personal convictions as to how or why they should help maintain these systems or change their consumptive lifestyles.

Through intentional programmatic relationships and site design, designers can provide environments for user interaction with the eco-technologies. Over time, these interactions foster user ownership within the right-of-way cultivating “dynamic users” who each possess a personal land ethic as a part of their value system. “Dynamic users” are personally invested in the public right-of-way and will take advantage of chance opportunities to share with visiting users about the ecological systems present. Additionally, they will be motivated to aid the local municipality in the long-term cyclical maintenance of the system. Most importantly, “dynamic users” will advocate for the investment of capital to rebuild the ecological and social systems following a disaster of some kind that leaves the corridor in ruin.



MEANING

ecological urbanism “resilient streets”

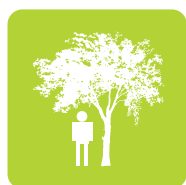
To what extent does the urban right-of-way cultivate educated, “dynamic users” who in ownership of the public space and engage in actions that promote resiliency within the



GENIUS LOCI

landscape urbanism “destination streets”

To what extent does the urban right-of-way use ecological processes through time to engender its distinctive character and unique identity toward a community of users?



ECOLOGY

landscape urbanism “green streets”

To what extent does the urban right-of-way reintegrate natural processes into the urban eco-technologies that promote healthier environments and an improved quality of life for



SAFETY

new urbanism “complete streets”

To what extent does the urban right-of-way promote equal opportunity and experience through the health, safety, and welfare of all users?



FUNCTION

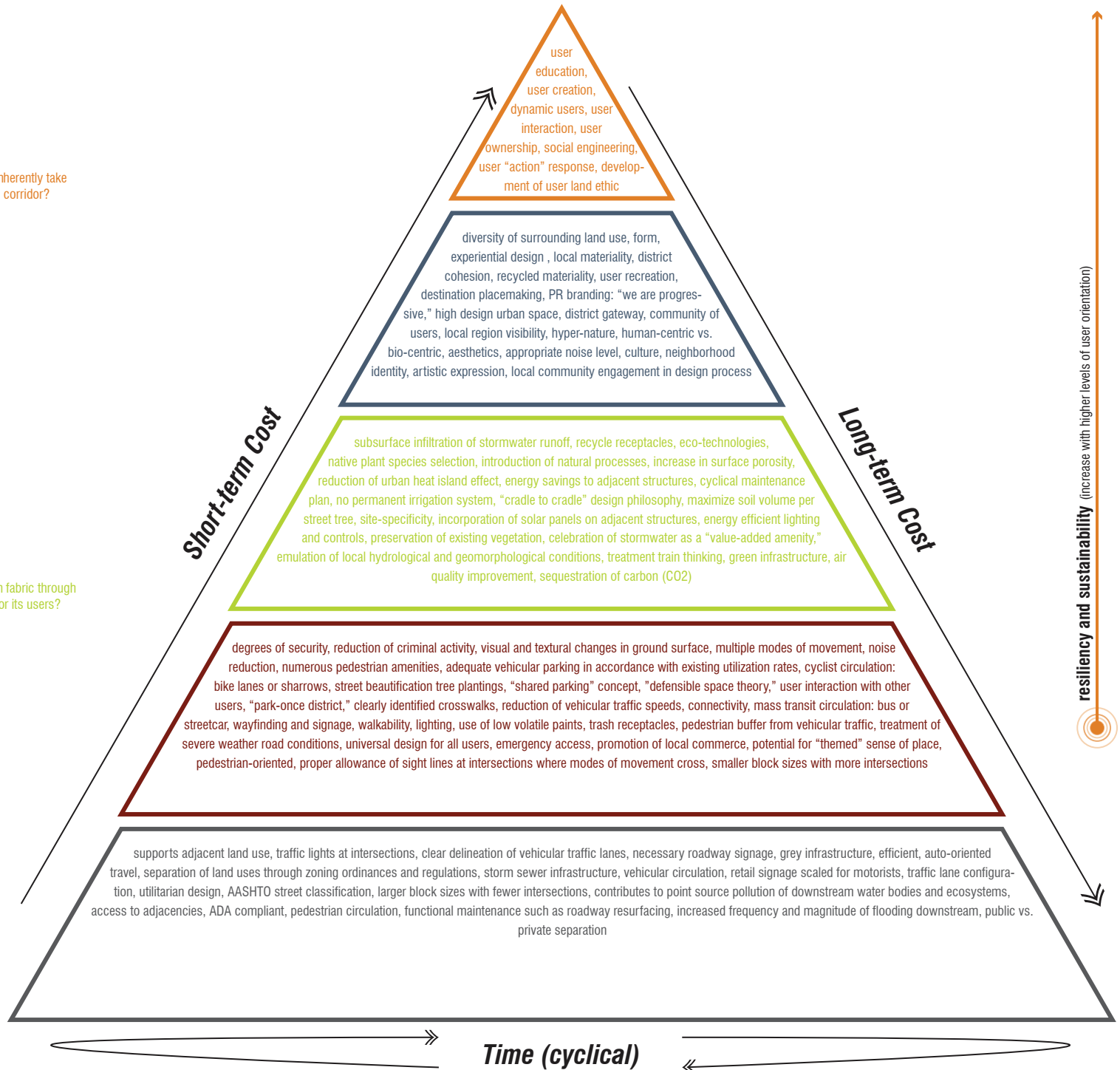
“conventional streets”

To what extent does the urban right-of-way provide the most basic levels of service to users for their efficient movement from one point of reference to another?

Figure 2-3: Hierarchy of User-oriented Streets framework. (created by author)

herently take
corridor?

n fabric through
or its users?



Ideally, meaning is the level that landscape architects and urban planners should strive to attain in their projects; however, at this point in time, one must ask if the previous description of meaning is too far from reality to adequately grasp in our lifetime. Is it wrong to think about streets possessing the capacity to challenge the consumptive habits of our nation? Or, does the proposed Hierarchy of User-oriented Streets framework provide us the ability to visualize the process needed to reach out and grasp this ideal successfully transforming our streets from the “leftover” spaces of yesterday? Perhaps meaning exists only in the mind of the dreamer. Then again, is there a problem with striving for a standard that, no matter how close we get, always pushes us to go a little further the next time around?

Long-term Cost vs. Short-term Cost

Economics cannot be overlooked when proposing new design theories. For this reason, short-term and long-term cost trends are attached to the outer portion of the framework (see Figure 2-3). In the short-term, the cost of constructing and maintaining an urban right-of-way increases as the level of user orientation increases. In the long-term, the cost of constructing and maintaining urban rights-of-way increases as the level of user orientation decreases. With higher levels of user orientation, greater numbers of program elements must be included into the design, therefore, driving up the short-term costs. In many cases, limited construction budgets require the value engineering of higher level program elements seen as non-essential to the function or safety of the corridor. The result is a lower level of user orientation and right-of-way productivity.

While higher levels of user orientation are more costly in the short-term, they yield higher profitability margins in the long-term as urban rights-of-way transition from thoroughfares toward destinations offering many more services beyond vehicular passage. Moreover, eco-technologies have the ability to pay for themselves by reducing

the amount of stormwater handled and treated by a city’s infrastructure, by increasing energy savings to adjacent structures, by reducing the frequency and magnitude of flooding downstream, and by requiring fewer air and water quality remediation efforts.

Associated Hierarchies

Intended to advance the current discourse surrounding “complete streets” and “green streets” theory, the Hierarchy of User-oriented Streets framework makes an attempt at attaching contemporary urbanisms and street design movements to their appropriate level of user orientation. While not the sole focus or purpose of the framework, it opens up new avenues and platforms from which the facilitation of new ideas and discoveries can take place. Furthermore, the hierarchical ranking inherently argues for which of the urbanisms and movements have the most value toward resiliency and sustainability.

Figure 2-3 attaches New Urbanism, Landscape Urbanism, and Ecological Urbanism to the levels of the proposed framework in which they are most suitable. These urbanisms represent popular and emerging ideological differences on how the design professions should address the many complexities of urban expansion and revitalization. Consequently, none of these urbanisms are centered exclusively upon the design of urban rights-of-way. Rather, each has applicable ideas within the overall urbanism that can guide how we design, construct, and maintain our cities’ streetscapes and infrastructure.

New Urbanism is “a movement in architecture and planning that advocates design-based strategies based on ‘traditional’ urban forms to help arrest suburban sprawl and inner-city decline and to build and rebuild neighborhoods, town, and cities” (Bohl 2000, 762). In opposition to the prevalent trend of building placeless, low-density towns on the periphery of central cities, New Urbanism aspires to build strong, integrated community centers reminiscent of pre-World War II communities. The guiding principles of New Urbanism include walkability,

connectivity, mixed-use and diversity, mixed housing, quality architecture and urban design, traditional neighborhood structure, increased density, green transportation, sustainability, and quality of life.

While many of its guiding principles are the ingredients for strong communities built upon identity and place, New Urbanism has been attached to the safety level, not the genius loci level of the proposed framework. At first this may seem like somewhat of a contradiction; however, a closer look at the criticisms leveled against two of its highly espoused precedent communities reveals a tendency in the urbanism to stage or theme a false sense of place.

After reading about the “successful” developments of Seaside and Celebration (both located in the state of Florida), many people naturally assume the principles of New Urbanism to be the panacea for urban sprawl. On the contrary, both of these communities receive strong criticisms from opponents that question their validity and longevity. One of the most prevalent criticisms is the artificial character exhibited within these communities (Lehrer n.d.). For instance, Celebration is criticized for feeling more like a highly themed Disney resort than an independent community with a unique sense of place. A second criticism leveled against these communities is their failure to obtain a diverse population. In both cases, White, affluent residents constitute the majority of what is supposed to be a diverse community (Briney 2009). A final criticism leveled against Seaside and Celebration is their isolation from the surrounding contexts (Lehrer n.d.). Though New Urbanism sounds like a packaged “success story” within the literature written by its proponents, the movement remains in its infancy struggling to find a strong foothold. For these reasons, the proposed framework considers the premise of this urbanism useful in creating “complete” communities, but not distinct places grounded in a “community of users.”

While New Urbanism has been in existence for the last 30 years, the realization of Landscape Urbanism and Ecological Urbanism has occurred only within the last decade. As emergent fields of thought,

they challenge the traditional role of architecture as the object around which cities should be designed. Distinctions between the two urbanisms are not easily identifiable due to the overlap in many contiguous discourses and inquiries. Still, it is important to differentiate between the two in order that a hierarchical order might be assigned.

For this reason, the definitions of others will be used to define each within this report. Landscape Urbanism is an interdisciplinary movement that advocates for a paradigm “shift away from the discrete, architectural object as the primary organizing device of the city” (Fulton 2006, 51). Ecological Urbanism is an interdisciplinary movement towards “city-making that is focused on the reintroduction of landscape elements and their continuity into the urban environment” (ASLA 2010). As unsuccessful as these definitions are at capturing the complexity of each urbanism, they do provide a basis for hierarchically attaching the urbanisms to the proposed framework. Landscape Urbanism is attached to the ecology and genius loci levels as it revolves around the broad idea of moving away from object-based city planning and design. Ecological Urbanism is attached to the meaning level as it specifies the integration of ecological processes as the means by which urbanity should continue to grow in the future.

The ordering of the two urbanisms is not intended to explicitly state that one is more important than the other. They are not competitors; both offer valuable insight to the future design of cities. Instead, landscape architects and urban planners should understand Ecological Urbanism to be the second generation or “child” of Landscape Urbanism in an age when the talk of sustainable design practices is ubiquitous throughout the public media.

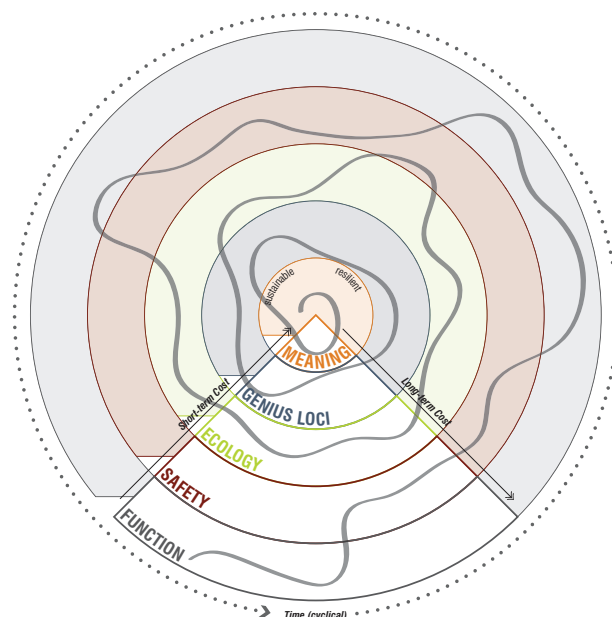
Similar to the contemporary urbanisms, street design movements benefit from being attached to the Hierarchy of User-oriented Streets framework. Two existing movements referenced throughout an abundance of published literature are “complete streets” and “green streets.” In addition to these two, the terms “conventional,” “destina-

tion,” and “resilient” have been selected as the names of other potential street movement types providing further clarity and understanding of the proposed framework. Below, a description of each movement is presented from the lowest level of user orientation to the highest. Note that the particular discussion surrounding “destination streets” and “resilient streets” is presumptive of future street movements that might one day surpass “green streets” in importance.

Characteristic of most streets in America today, “conventional streets” are urban rights-of-way that are largely built and maintained for the basic functional transportation needs of the everyday motorist. Attached to the function level of the proposed framework, “conventional streets” are often classified by engineers according to their right-of-way size and capacity to move vehicles efficiently. Spaces along these streets are bland with little to no ornamentation.

Attached to the safety level of the proposed framework, “complete streets” are multimodal, urban rights-of-way that are built and maintained to support safe and attractive environments with an equal level of service for all users. Design Workshop’s proposal for South Grand aspires to be a “complete street.” Though these streets often incorporate street trees and other plantings, these elements are primarily selected for their corridor beautification properties, not their level of ecosystem service.

Next, “green streets” are urban rights-of-way that are built and maintained to sustainably handle stormwater runoff, reduce fluvial peak flows, improve water quality, and enhance watershed health through the use of ecological processes in the urban fabric. Attached to the ecology level of the proposed framework, “green streets” must be responsive to the function and safety aspects of the right-of-way. Therefore, if a progressive “green street” project introduces ecology in a way that compromises user safety or function, the users will not support its construction and/or continual economic investment toward long-term maintenance.



Once natural processes have been introduced, a street may rise to the genius loci level if given enough time. “Destination streets” are urban rights-of-way that use highly designed ecological processes through time to build and maintain a distinctive, district identity exemplified by a strong community of users and tremendous sense of place. These streets are recognized as unique districts for user entertainment and amenities, not vehicular thoroughfares.

Finally, attached to the meaning level of the proposed framework, “resilient streets” are urban rights-of-way built and maintained through time by their “dynamic users” enabling the corridor to overcome any and all natural, social, and economic disasters that may arise. Through time, users who frequent the right-of-way develop personal understandings of the role that the natural processes have in the urban environment. These understandings eventually coalesce into the formation of their personal land ethics. Motivated to action, these “dynamic users” become the voice of the right-of-way advocating for and participating in its necessary cyclical maintenance practices.

Framework through Time

Maslow’s Hierarchy of Needs framework did not include any indication of the dimension of time. Due to the temporal characteristic of landscapes, the Hierarchy of User-oriented Streets framework must include the effect time has on urban rights-of-way. Figure 2-4 transforms the pyramidal form of the framework into a circular form so as to better represent the cyclical properties of time. The light gray, undulating line represents the path of an urban right-of-way through time. Beginning as an everyday, functional street, the right-of-way experiences several design interventions that increase its level of user orientation. While fluctuating between levels due to lapses in proper cyclical maintenance, the right-of-way progresses toward the center where sustainability and resiliency reside.

The emphasis on time brings up two notions that are important

Figure 2-4: Framework through time. (created by author)

to consider. First, an urban right-of-way's level of user orientation can fluctuate as a result of poor maintenance practices, subsequent design interventions, and external forces such as changing user need. Second, when making evaluations or comparisons between two corridors, it is important to understand at what point in the cycle each right-of-way exists. Further discussion on the latter notion is expanded upon later within the precedent study analysis for St. Charles Avenue (see pages 51 and 52).

Ongoing maintenance is crucial to the success and equilibrium of the urban right-of-way. Without proper maintenance, it can slip relatively quickly into a lower level of user orientation as users become concerned with their safety. For instance, failure to continually remove debris from the trench drains and forebays of the stormwater planters will eventually lead to unwanted ponding. Consequently, the stagnant water will provide mosquito populations the perfect conditions from which they can thrive. Of course, once people realize the negative effects, they will demand the immediate removal of the eco-technologies from the urban environment. Unfortunately, many will never understand that it was the lack of maintenance that caused the systems to malfunction. They will continue on with their lives in complete ignorance of the consequences their actions have upon the natural environment.

Framework Conclusion

The dilemmas surrounding aging infrastructure will only increase in the coming decades. Landscape architects and urban planners are poised to lead discussions on how the design of tomorrow's infrastructure can both serve the functional needs of society and create meaningful places for user enjoyment and education. The journey toward resiliency will be neither quick nor painless. We will have to be willing to take multiple risks trying new, innovative ideas with some level of anticipated failure. Only then will we find the right combination of parts and ideas to build a better tomorrow for future generations.

Change rarely comes easy but is always worth it in the end. A look back into our country's brief history reveals an assortment of misfits who never let anybody tell them "no" and who always found a way. Our forefathers defeated the British against all odds. Our parents' and grandparents' generations put a man on the moon before any other country. Surely, we can figure out how to design, build, and maintain our cities for long-term sustainability.

In the same manner as Maslow's Hierarchy of Needs framework provided a model for changing the way that managers view their labor force, the proposed Hierarchy of User-Oriented Streets framework provides landscape architects and urban planners a model exhibiting the necessary steps for perceiving our cities' urban rights-of-way for their resilient potential. Progressing through the levels of function, safety, ecology, genius loci, and meaning, urban rights-of-way will attain higher levels of user orientation, thus yielding higher levels of resiliency and sustainability.

Since the publication of his work, Maslow's Hierarchy of Needs framework has come under great scrutiny by some within the scientific community. They claim that his research was not founded solely on the principles of the scientific method. Nonetheless, no one can argue with the tremendous impact his framework has had on managerial thinking and academics. "His work inspired other researchers to ask new questions about motivation and rewards, about the design and evaluation of performance, and about how 'optimal performance' on the job might be accomplished" (Goodall and Goodall 2006, 39). In a similar manner, the content of this report does not quantifiably prove the value of this framework to the scientific community. The hope is that others will be inspired by the proposed framework and subsequently take the thoughts and ideas presented within this report to further levels of competency and advancement.

Precedent Study Analysis

methodology

The overall purpose of the precedent study was to attain three specific end goals: use the precedent study as a means of (1) continuing to explore and extract information from the body of related literature, (2) refining the development of the theoretical framework through the implementation of a feedback loop, and (3) advancing the initial program considerations for South Grand.

Prior knowledge and an ongoing literature review provided a wide variety of potential precedent projects to be broken down and analyzed. As indicated in the precedent study methodology diagram, these projects had many disparate factors associated with them including project type, available information and imagery, location, relevancy to theoretical inquiry, and my existing knowledge from previous site visits. In order to further understand how each project could contribute to the development of the proposed theoretical framework, the projects were filtered through contemporary landscape architectural theories pertaining to streetscape and urban design. Subsequently, four projects/streets were chosen to be studied: the SW 12th Avenue Green Street located in Portland, Oregon, the 12th Street Rain Gardens located in Kansas City, Missouri, St. Charles Avenue located in New Orleans, Louisiana, and Stephen Epler Hall located on Portland State University (PSU) in Portland, Oregon.

The selection of each of these precedents was intentional. Built in 2005, the SW 12th Avenue Green Street Project was an ASLA award winning project and the city of Portland's first "green street." As a result, this project is frequently referenced as an archetype for a growing number of stormwater infrastructure projects around the country. One of those projects includes the 12th Street Rain Gardens Project located in Kansas City. Due to the overall lack of interest and support for new innovative stormwater infrastructure designs in the city of St. Louis, this project was selected as a leading regional precedent for new ideas in retrofitting existing streetscapes. Though not specifically a project, St. Charles Avenue was selected to illustrate an interesting exception

potential precedents



filter a

CONTEMPORARY
LA THEORIES

to the fundamental principles of the proposed theoretical framework. Finally, Stephen Epler Hall was selected as a project located directly adjacent to a streetscape in which the designers used a high degree of user orientation exemplified through a non-didactic educational emphasis. The overall goal for selecting each of these precedents was that the proposed theoretical framework could be further developed.

These four projects were analyzed using a "coded imagery analysis" based upon the five proposed levels of user-oriented streets: function, safety, ecology, genius loci, and meaning. The initial method for this type of analysis included finding a suitable photograph that characterized the breadth of the project's important design/programmatic elements. Once I had retrieved an image, I used a digital selection method to extract certain elements in the scene that would then be color-coded to the five previously mentioned stages. It is important to note that the coded imagery analysis was not intended to be a direct comparison from one project to the next, although some comparisons were warranted. As such, the vantage points of each project's photograph are not required to be from the same perspective. Through initially coding these images, I developed an understanding for the project's primary design elements and was able to record a set of observations for each level in the framework. By synthesizing the observations, I was then able to make an overall evaluation of where the project falls on the framework/metric scale. Finally and most crucial to this process, the evaluations and observations were sent back into the proposed framework as feedback for further development.

ongoing literature



re review

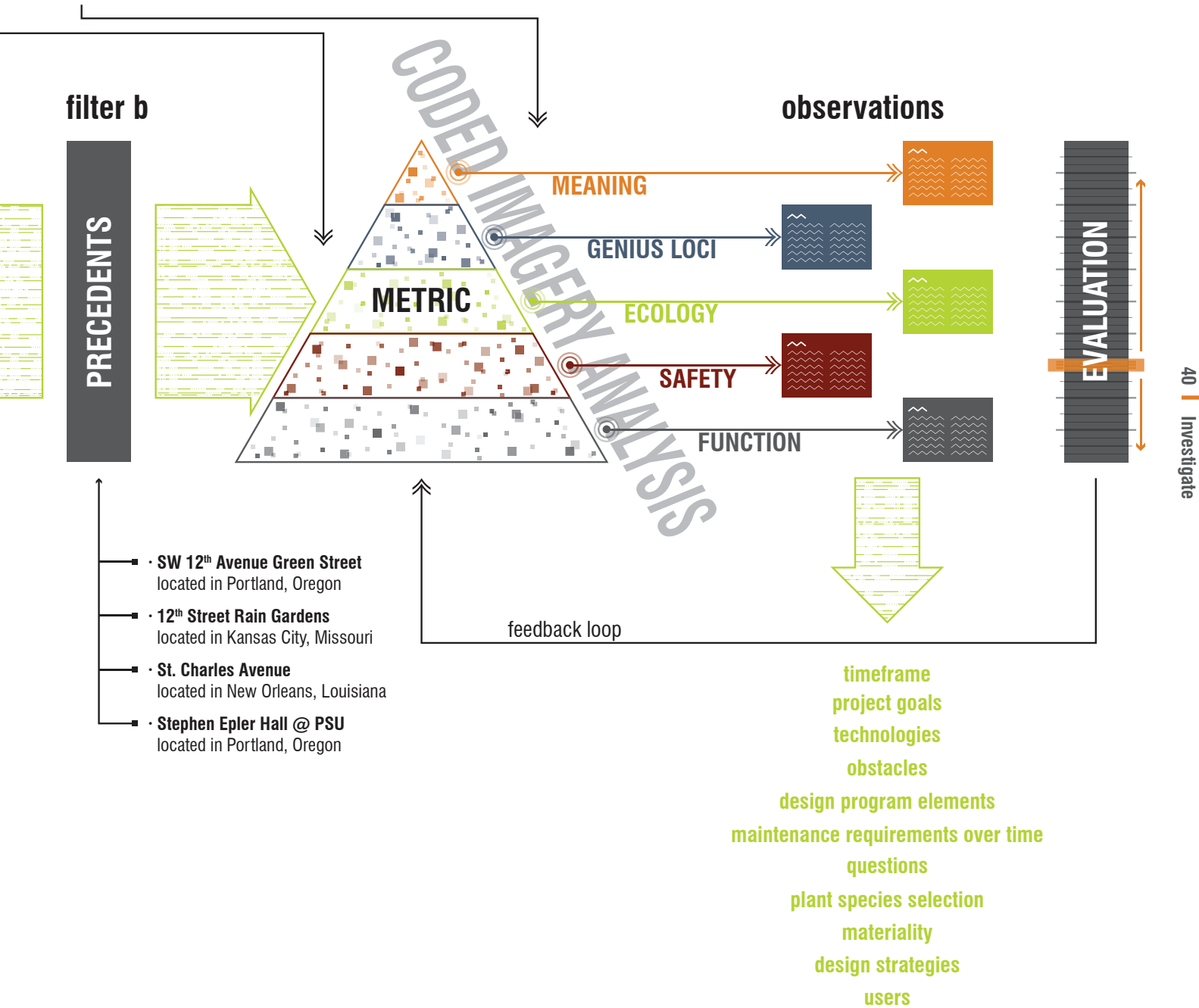


Figure 2-5: Precedent study methodology diagram. (created by author)



Figure 2-6: Aerial view of the SW 12th Avenue Green Street project site. (Bing Maps)



Figure 2-7: Existing site conditions prior to design improvements. (www.asla.org)

sw 12th avenue green street | portland, or

Reason for Selection

The city of Portland is by far the most progressive city in the United States when it comes to addressing how ecological processes can be reintegrated into the urban right-of-way. Built as the city's first green street, this demonstration project has garnered national attention for its innovative design strategies in reducing the burden of stormwater runoff in a way that positively recaptures underutilized sidewalk space as a value added amenity to the surrounding community. Since receiving the American Society of Landscape Architects' (ASLA) 2006 General Design Award of Honor, this project has influenced a growing number of green street projects throughout the country (ASLA 2006).

Contextual Information

- Location: SW 12th Avenue between SW Mill Street and SW Montgomery Street
- Project Type: stormwater retrofit of an existing collector street
- Date of Construction: May – June 2005
- Catchment Area Size: 7,500 sq. ft. of impervious surfaces
- Designer: Kevin Robert Perry, Bureau of Environmental Services (BES) Green Street Specialist
- Client Entity: City of Portland, Oregon
- Cost: \$38,850
- Ongoing Maintenance: shared responsibility between the city of Portland and Portland State University (PSU)
- Goals: create a project that: (1) is low-cost in its design and execution, (2) benefits the environment and embodies community livability, and (3) provides a model for other jurisdictions in addressing important national and local stormwater regulations
- Primary Program Element: stormwater infiltration planter (18' in length by 5' in width)



Figure 2-8: Coded imagery analysis for the SW 12th Avenue Green Street Project. (graphic created by author over imagery provided courtesy of the Bureau of Environmental Services)



Figure 2-9: View of stormwater planter during rainfall event. (www.asla.org)

Function

Site selection criteria were important factors to consider during the initial stages of the project. Classified as a collector street, SW 12th Avenue presented a favorable urban right-of-way with a suitable street slope of two percent, only one underground utility conflict (an existing gas service line for the adjacent building), adequate space for the stormwater planters, an optimal location for the installation of flow monitors and rain gages, and no conflicts with the adjacent land uses (City of Portland 2010). The selected location was ideal for a stormwater retrofit that would not adversely affect the existing functionality of the urban right-of-way.

While striving to set a precedent for future stormwater design within the urban right-of-way, this project would ultimately fail to be successful if it did not adhere to the existing vehicular and pedestrian circulation. As such, the implemented design does not reduce the number of on-street parking stalls. Nor does the design infringe upon the amount of space a pedestrian has to comfortably move from one place to another. On the contrary, the designer strategically selected the wasted landscape zone, located between the sidewalk and on-street parking, for the space required to accommodate the new stormwater infiltration planters (see Figure 2-7).

Safety

Benefitting from Portland's unique, pedestrian-scaled blocks, this green street project already exemplified many of the components within the safety level of the proposed Hierarchy of User-oriented Streets framework. At the same time, the implementation of this project increases user orientation by creating aesthetically pleasing eco-technologies that are appropriately scaled for the pedestrian, by enhancing the connectivity between the on-street parking stalls and the sidewalk, by incorporating street beautification through an increase in green vegetation, and by employing the use of textural materiality changes to



Figure 2-10: Informative signage incorporated into the design to educate users about the ecological processes of the stormwater infiltration planters. (www.asla.org)

further delineate the primary circulation route for the pedestrian. In addition, there have been no reports of the stormwater infiltration planters serving as mosquito breeding grounds.

On the other hand, there is one missed opportunity that could have greatly increased the resiliency of the project. Seating was not included as a program element in the current design. A design proposal which had included seating could have offered users the opportunity to interact with each other and the eco-technologies more readily. Overall, the success of the green street would not have taken place had the functional and safety components not been so well addressed.

Ecology

A reintegration of ecological processes into the urban environment is accomplished through the design of four congruent, stormwater infiltration planters. Each planter is connected to the next downhill planter with the exception of the last planter which outlets into the existing combined sewer. During a rainfall event, stormwater runoff flows along the existing curb and gutter until it reaches the first stormwater planter. At this point, the runoff enters the first planter through a 12-inch-wide trench drain located underneath the parking egress zone. Upon entering the stormwater planter, the runoff is "allowed to pond to a depth of 7 inches before infiltrating through the soil at a rate of approximately 4 inches per hour" (City of Portland 2010, 2). If the amount of stormwater runoff exceeds the capacity of the planter, it immediately exits out a second trench drain and flows along the curb until entering into the next stormwater planter and so on. As mentioned before, once the fourth planter reaches full capacity, the stormwater runoff overflows into the existing combined sewer system.

The project's ecological components can be broken down into three categories, each with differing functions. First, "the upright growth structure of *Juncus patens* slows down water flow and captures pollutants, while its deep penetrating roots work well for water

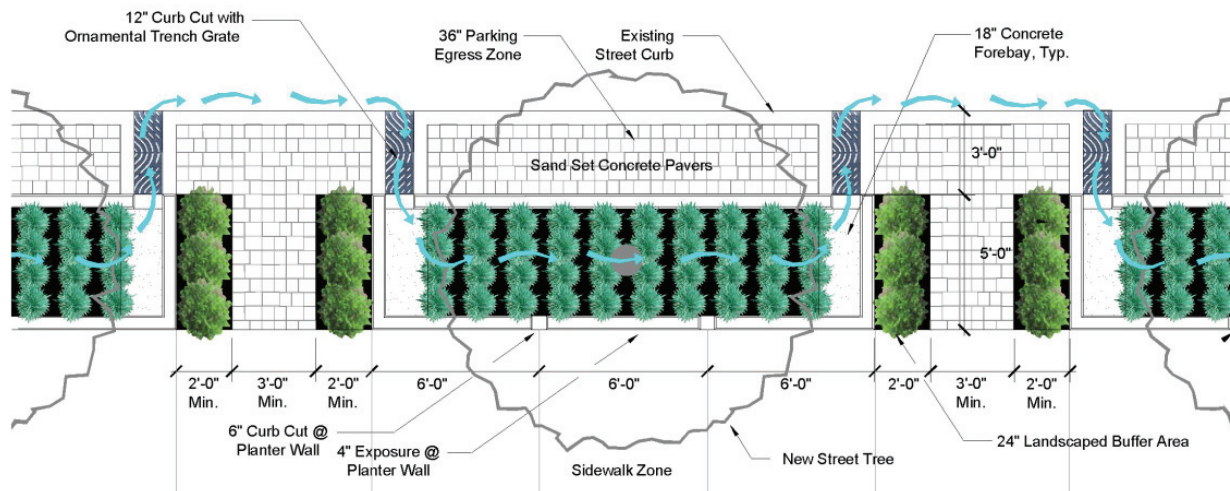


Figure 2-11: Site plan enlargement detail illustrating how stormwater flows into and out of the infiltration planters. (www.asla.org)

absorption” (ASLA 2006). Second, the Tupelo Tree (*Nyssa sylvatica*) functions to provide long-term, appreciating benefits, such as carbon sequestration, greater stormwater absorption, and a reduction in energy costs for adjacent buildings, while also serving its users with a beautiful fall color. Finally, the external plantings (*Nandina domestica* ‘Moon bay’; *Liriope muscari* ‘lilac beauty’; and *Polystichum munitum*) located directly adjacent to the stormwater planters provide a visual landscape buffer to soften the overall appearance of the stormwater planters. Each of these components work together to accomplish a multiplicity of goals that include a decrease in the amount of runoff burdening the existing combined sewer system, greater soil volume per street tree resulting in longer lifespans, the celebration of stormwater infrastructure rather than the prevalent “out of sight, out of mind” mentality, an increase in surface porosity, and the incorporation of a treatment train to increase water quality.

Interestingly enough, from the moment the stormwater enters the curb cut, safety design components encompass its path providing users an ecological amenity while also considering their safety as a prerequisite for ecological process. In the design proposal for South Grand, similar cues should be observed if eco-technologies are to be successfully adopted by the users.

Genius Loci

At this point, not enough time has passed since the project’s implementation to elicit a user orientation rating of anything higher than ecology; however, there are several indications that this project might one day enter into a low level of genius loci. These indications include the artistic detailing of the steel grates over the trench drains, the public relations branding that very clearly states, “we are progressive,” and most importantly, the inclusion of user engagement in both the design process and ongoing performance monitoring research. Only time will tell if this project can attain the genius loci level of user orientation.

Meaning

Unfortunately, the SW 12th Avenue Green Street does very little to promote the development of “dynamic users” other than a small amount of didactic signage; however, as an archetype for the design of future stormwater infrastructure in the urban right-of-way, this project is staged to have a lasting legacy toward its influence on a variety of professionals and students who seek to question the status quo of stormwater infrastructure design. Following their individual investigations of the project, they return home carrying new knowledge of how ecological processes can function within the urban environment. In this capacity, I believe that this project has a great potential to indirectly cultivate “dynamic users” in many other places than its immediate surroundings. Still, in order for SW 12th Avenue to reach its highest potential for resiliency, local users must become motivated, dynamic components of the site itself.

Conclusion

Built in the summer of 2005, this street retrofit project demonstrates (1) how new and existing streets within highly urbanized areas can be designed to provide direct environmental benefits and (2) be aesthetically integrated into the urban streetscape as an amenity. Currently, this project is operating in the ecology level of the proposed theoretical framework. Through time, it is likely that this project will enter into a low level of genius loci depending on how well the ecological systems are maintained and to what extent users identify with the public space. I do not foresee how this project will cultivate local “dynamic users” without the implementation of another design intervention that further increases user orientation. This conclusion is not surprising as the project’s initial goals failed to include any indication toward higher level components.



Figure 2-12: Aerial view of the 12th Street Rain Gardens project site. (Bing Maps)

12th street rain gardens | kansas city, mo

Reason for Selection

While the importance of studying the SW 12th Avenue Green Street as the foremost archetype of “green street” design is unequivocally apparent, the climatic conditions surrounding Portland greatly differ from those in St. Louis. Consequently, it became important to search for a closer precedent project to South Grand that could offer insight into what design responses and plant species are most appropriate for the region. Located in Kansas City, Missouri, the 12th Street Rain Gardens Project desires to establish itself as a demonstration project for future right-of-way design within the downtown core of the city (BNIM 2010).

Contextual Information

- Location: 7-block area in the Central Business District between Wyandotte and Locust Streets
- Project Type: retrofit of public sidewalks
- Date of Construction: October 2007
- Catchment Area Size: unknown
- Designer: BNIM
- Client Entity: City of Kansas City, Missouri
- Cost: \$4 million for entire project, unknown amount for rain gardens and street tree improvements
- Ongoing Maintenance: City of Kansas City
- Goals: (1) to accommodate and sustain large trees in the design despite the presence of subterranean vaults which limit the depth of tree wells to accommodate each tree’s respective root system; (2) to design a pedestrian-oriented streetscape using the Downtown Streetscape Guidelines; (3) to be a demonstration project for future development in the downtown loop
- Primary Program Element: soil trenches, infiltration basins, native or adapted plants (for highly visible streets)



Figure 2-13: Coded imagery analysis for the 12th Street Rain Gardens Project. (graphic created by author over imagery provided by Tim McDonnell)

FUNCTION

SAFETY

ECOLOGY

GENIUS LOCI

MEANING

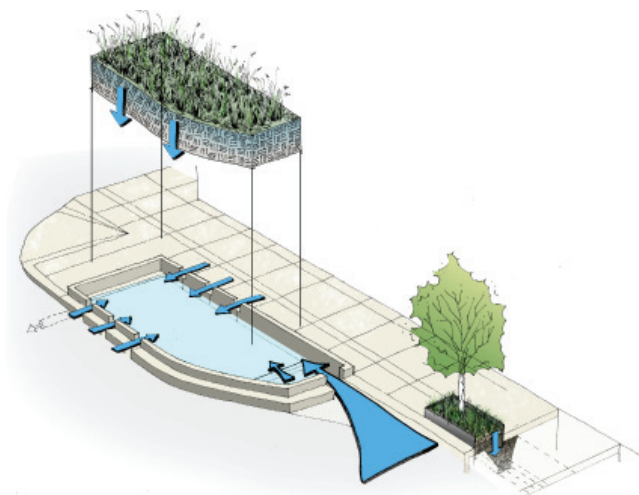


Figure 2-14: Conceptual drawing of hydrological processes in project. (courtesy Tim Duggan)

Function

The design proposal does little to affect how the existing urban right-of-way functions. Both before and after its construction, 12th Street has functioned properly allowing motorists to commute to their destinations with ease. The only major change made to the site's functional components would be the removal of several on-street parking stalls for the inclusion of planter bulb-outs at the intersections, two of which infiltrate stormwater. The coded imagery analysis for this precedent, Figure 2-13, reveals that the road surface is in an adequate condition with the appropriate delineation of vehicular lanes in the ground plane. As the design proposal does not address reducing or reconfiguring the vehicular travel lanes, no further functional analysis is needed.

Safety

While not progressively changing the site's travel lane configuration, BNIM's design proposal includes several safety components that enhance the pedestrian experience along 12th Street. First, the inclusion of curb bulb-outs at some street intersections effectively lessens the distance that pedestrians have to travel while crossing from one side of the street to another. In addition, it gives pedestrians a greater amount of space to gather at intersections while waiting to cross the street. Second, the street is unified as a whole through the consistent use of similar lighting, signage, materiality, and new, above-grade street tree planters. From one end of the site to the other, the rhythmic placement of street tree planters helps to unify the streetscape for the pedestrian user.

It is important to note that the reference image for the coded imagery analysis was taken prior to the completion of the project's construction. The apparent safety concern surrounding the missing ADA compliant ramp at the intersection is negligible as it was addressed before the end of construction.

Ecology

The two most important ecology components in this project are (1) the integration of stormwater infiltration planters amidst a difficult urban site comprised by the presence of several subterranean vaults and (2) the design of a continuous soil volume for the long-term health and longevity of urban street tree populations.

In contrast to the 12th Avenue Green Street Project, the two stormwater planters are not connected to each other or other eco-technologies. Still, the independent planters collect and infiltrate stormwater runoff from the roadway and sidewalk surfaces. Whereas the previous project incorporated stormwater planters into the amenity zone within the middle of the block, this project takes advantage of the extra space afforded by the proposal of curb bulb-outs at the intersections.

Runoff enters the planters primarily from the street's curb (see Figure 2-14). Upon entering the planter, the runoff immediately passes through the concrete forebay where sediment and trash are captured for later removal by the city. Engineered soil containing 80% sand, 15% sandy loam soil, and 5% organics extends to a depth of 12-24 inches beneath the surface. At a 24-inch depth, these soils allow the stormwater planters to store approximately 1,800 gallons each. Selected plant species for the planters include Dwarf Variegated Maiden Grass (*Miscanthus sinensis*), Karl Foerster Feather Reed Grass (*Calamagrostis x acutiflora* 'karl foerster'), and Blue Flag Iris (*Iris versicolor*) (source: in-house firm document provided by Tim Duggan).

Genius Loci

Those involved in the design process included city staff, the parks and recreation department, the downtown council, and adjacent property owners. Aside from engaging the local community in the design process, this project does little to progress beyond the ecology level of the proposed framework. As the coded imagery analysis indicates (see Figure 2-13), the statue located on the adjacent parcel provides



Figure 2-15: Initial construction of one of the stormwater planters. (courtesy Tim Duggan)

the only genius loci component. This project did little to engage the art piece in a responsive way that could increase the identity of place. Rather, the design focuses on the introduction of ecological processes into the urban environment failing to orient itself to the users in a way that will develop a “community of users” centered on place.

Meaning

Other than the proposal for educational signage, this project does not contain any meaning components that will encourage the development of “dynamic users.” As a result, the city must always maintain the ecology components with no help from local users who have taken ownership over the public space.

Conclusion

Overall, this project contains many function and safety components. With the design of its two stormwater infiltration planters and continuous soil volume trench, the 12th Street Rain Garden Project enters a low level of ecology on the proposed framework. When compared on the surface to other projects in cities like Portland and Seattle, this project does not seem progressive; however, a closer look reveals that it provides a great precedent for how rights-of-way with challenging subsurface conditions can still include some ecological components. In this light, the project supports the hierarchical order in the proposed framework as it works around the existing function components located underground.



Figure 2-16: Installation of engineered soils within the stormwater planters. (courtesy Tim Duggan)



Figure 2-17: View of stormwater planter during rainfall event. (courtesy Tim Duggan)



Figure 2-18: Aerial view of the St. Charles Avenue study site. (Bing Maps)

st. charles avenue | new orleans, la

Reason for Selection

Unlike the others, this precedent is not an actual project designed by a given firm. Certainly, someone, at some time, conceptualized a plan for St. Charles Avenue; however, those plans are so dated that they hold little to no value in terms of furthering “green street” theory. Instead, the purpose for selecting this precedent is to study an urban right-of-way that exhibits a tremendous amount of genius loci while failing to properly function as a vehicular transportation corridor. The following observations are taken from my personal experiences and insights as a user of the corridor from January 2010 through August 2010.

Function

Of the selected precedents, St. Charles Avenue scores the lowest on its ability to provide the basic function elements of an urban right-of-way. As evidenced in its coded imagery analysis, the corridor fails to include painted stripes for vehicular lane delineation, the curbs and roadway surfaces remain in poor condition, and the current storm-water infrastructure is inadequate for meeting the demands of larger storm events. During my stay in New Orleans, it was not uncommon to observe out-of-town tourists driving down the middle of two vehicular lanes. This often provoked the locals to weave in and out while belligerently honking their car horns. Furthermore, roadway surface conditions are so poor that many cars exhibit an audible clanking or rattling, a clear indication that the excessive amount of pot holes has ruined the suspension of many cars. Of greatest concern is the potential for flooding along the street and adjacent properties. As the elevation of New Orleans is lower than both the Mississippi River and Lake Ponchartrain, every drop of water that falls on the city must be pumped out. On one Sunday morning, I personally witnessed excessive flooding on St. Charles Avenue when a two-inch rainfall event overloaded the pump stations resulting in the partial inundation of countless vehicles.

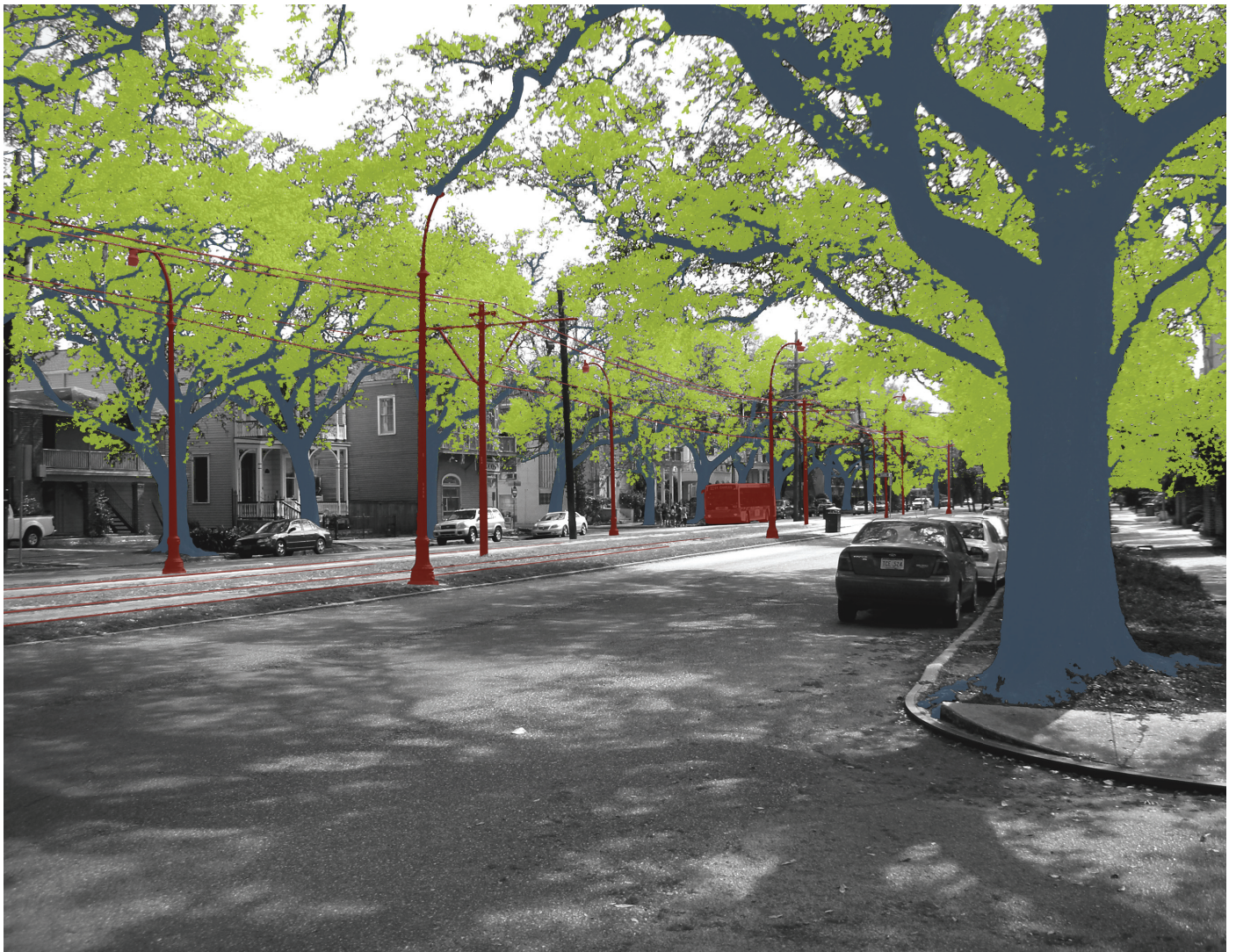


Figure 2-19: Coded imagery analysis for St. Charles Avenue. (graphic created by author over imagery photographed by author)



Figure 2-20: Streetcar operating within the median of St. Charles Ave. (photographed by author)

In accordance with the proposed theoretical framework, I believe that citizens of New Orleans would not approve the incorporation of innovative eco-technologies before the many functional problems of St. Charles Avenue are adequately addressed.

Safety

In this category, St. Charles Avenue is highly polarized. On one hand, the urban right-of-way supports two alternative forms of transit: a streetcar line and city bus system. On the other hand, it fails to provide safe passage for pedestrians and cyclists wishing to move throughout the corridor. With no designated bike lane, cyclists have to continually be on the lookout for their own safety while traveling alongside unconcerned motorists. The pedestrian experience is not much better as deteriorating sidewalk conditions require a person to be continually vigilant of unexpected vertical changes in the ground surface due to unmonitored tree root growth. As such, there are many places along St. Charles Avenue that only certain users, those without mobility impairments, can readily access. Overall, with the existing mass transit alternatives to the vehicle, this right-of-way could certainly become an exemplar “complete street” should the city ever implement a design intervention to address the harmful conditions for cyclist and pedestrians.

Ecology

In contrast to the other precedents’ relatively new plantings, the coded imagery analysis for St. Charles Avenue reveals the large extent of existing ecology within the urban right-of-way (see Figure 2-19). New Orleans’ temperate climate allows these Live Oaks (*Quercus virginiana*) to flourish as evergreen trees year round. While many users pass through the corridor in awe of the majestic beauty of these large urban trees, I believe few realize the important role that they serve in stormwater runoff absorption. The following quote is taken from an urban forest ecosystem analysis conducted by American Forests in



Figure 2-21: Many sidewalks in New Orleans’ Garden District fail to comply with the minimum ADA standards constraining some users with mobility impairments. (photographed by author)

2002. “The total stormwater retention capacity of the urban forest in New Orleans is 370 million cubic feet in avoided storage of water and is valued at \$741 million (based on construction costs estimated at \$2 per cubic foot to build equivalent retention facilities)” (Urban 2002). This statistic irrefutably testifies to the important role that ecology has within New Orleans’ urban fabric.

Genius Loci

While this particular urban right-of-way clearly fails to adequately address both function and safety, the swooping form of the branches and the buckling power of the shallow roots allow the Live Oaks to engender a distinctive character and unique identity within the corridor. Each year, people from around the country and world are drawn to New Orleans as a destination to see something that most of them cannot find back at home – a street with a tremendous sense of place. No matter how dysfunctional and unsafe the right-of-way may be, when users travel along St. Charles Avenue, they know that they are in the heart of New Orleans.

At first glance, this presents a daunting exception to the fundamental principles guiding the proposed theoretical framework. Is it probable that an urban right-of-way could sustain a higher level of user orientation such as genius loci without fulfilling the lower levels such as safety or function? After struggling with this question for some time, I discovered what I believe to be an explanation for its occurrence. Referring back to the theoretical framework diagram (see Figure 2-3), time is indicated on the bottom to be a cyclical process. Until now, I had not fully realized the importance of time’s cyclical property in the theoretical framework. St. Charles Avenue happens to be at a different point in time than the other two urban rights-of-way previously discussed. Over a century ago, when its mature Live Oaks were first planted as small saplings, the users of the corridor would not have supported the trees’ planting had their functional and safety needs not



Figure 2-22: Users take ownership of the urban right-of-way during Mardi Gras parades. (photographed by author)



Figure 2-23: On the day of Mardi Gras, the streetcars are shutdown allowing many users to set up camp sites along the median. (photographed by author)

been met. Of course, times were different then requiring fewer components to be incorporated into the design at lower levels in comparison to those listed in the theoretical framework for today's streets. Through time, we are now able to observe an urban right-of-way whose ecology has fostered a unique identity while a continual lack of function and safety maintenance has compounded into the significant erosion of the theoretical framework's foundational levels.

Consequently, my conclusions are that it is possible for the ecology of an urban right-of-way to flourish over a period of time with the outcome of *genius loci*; however, with little to no design interventions in the function and safety levels, the current *genius loci* stands in harm's way as the ecology slowly dies out leaving the corridor with no remaining identity. Even if users realize one day that St. Charles Avenue is losing its unique identity, I would argue that they will not support the introduction of more ecological components before the missing function and safety components are addressed.

Meaning

The absence of meaning along St. Charles Avenue is further proof that this corridor is in decline. Without a contemporary design intervention, this urban right-of-way will never be able to cultivate "dynamic users," foster user ownership, or promote a "user land ethic." The inevitable outcome is a lack of resiliency that might one day be fully realized when a particular natural, social, or economic disaster leaves the corridor in ruin, unable to return to its apex.

Conclusion

Through this analysis of St. Charles Avenue, an apparent exception in the proposed theoretical framework has been made known. In much the same way that Abraham Maslow would readily admit to there being exceptions in his Hierarchy of Needs framework, I also acknowledge potential exceptions. Maslow would argue that though his theoretical framework was fundamentally correct, there were special cir-

cumstances when his theory failed to apply. One example of this would be when an artist remains in a highly creative, "self-actualizing" state though he/she has not eaten or slept in several days. He dismisses this anomaly by rightly arguing that his theory works for most of the population, most of the time. Similarly, I too argue that the proposed theoretical framework, the Hierarchy of User-oriented Streets, works for most urban rights-of-way, most of the time.



Figure 2-24: Aerial view of Stephen Epler Hall project site. (Bing Maps)

stephen epler hall @ psu | portland, or

Reason for Selection

Though this project falls outside of the urban right-of-way focus of this report, it offers unique insight into how a designer could program a space for interactive user education in addition to a nominal amount of didactic signage. While the three previous precedents failed to include program elements within the meaning level of the proposed theoretical framework, this project embodies a user-oriented design philosophy that begins to consider how a user could experience the site during a storm event without compromising his/her safety. Additionally, the project is observable from SW 12th Avenue and therefore provides innovative ideas for incorporating “artful rainwater design” strategies within vacant or underutilized parcels located directly adjacent to urban rights-of-way.

Function

Although the site does have functional components specific to small urban plazas, they do not follow those outlined in the proposed theoretical framework for urban rights-of-way. This being the case, functional components were not observed in any detail and are not intended to be further analyzed within this report.

Safety

Observations of safety components were also difficult to extract given the necessity of an urban right-of-way. A few exceptions worth noting include the strategic placement of stone blocks for user seating, the inclusion of lighting, and aluminum skateboard deterrents. The seating reinforces the spatial design of the pedestrian-oriented environment while also providing users the opportunity to sit and observe the environment around them. Due to the sunken nature of the stormwater planters, lighting at night is a necessity for the safety of the site’s users. Skateboard deterrents offer a sign of the intended use of the plaza and encourage users to congregate without fear of being in harm’s way.

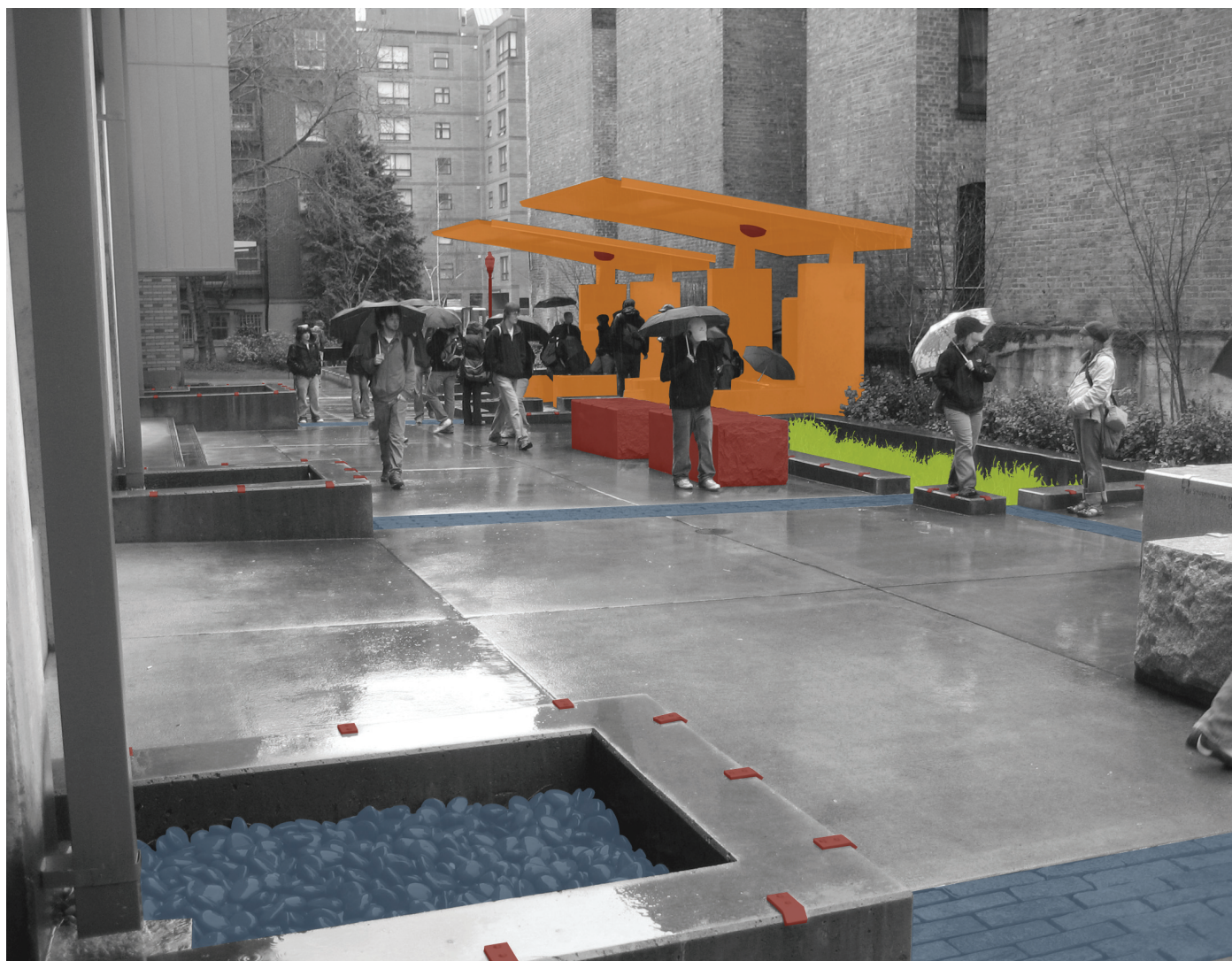


Figure 2-25: Coded imagery analysis for Stephen Epler Hall. (graphic created by author over imagery provided by Lorn Clement)



Figure 2-26: Conveyance of stormwater from building to planters.
(http://mithun.com/projects/project_detail/stephen_epler_hall/)

Ecology

This project's integration of architecture and the stormwater features of the urban plaza is metaphorical of the coordination that needs to take place in everyday practice if ecology is to be successfully reintegrated into the urban fabric. "During rain events, water shoots down a five-story downspout into a rock-filled basin, gushes out a small scupper into a runnel that directs water across the space, then falls into a 'biopaddy' (a sunken plant-filled basin)" (Echols and Pennypacker 2008, 276). In contrast to the treatment train concept used for SW 12th Avenue Green Street, this project uses ecology as the visual destination for the runoff rather than the serial workhorse of performance based planters.

Genius Loci

Designed primarily for students living in residences located above classroom and office spaces on the ground floor, the urban plaza provides a setting where its users can learn of the university's desire to accommodate more students while decreasing the carbon and economic footprint of expansion (Mithun 2010). In this light, the plaza works in conjunction with the architecture to positively brand the university's progressive vision. Specific genius loci components include the use of local materiality, artistic expression, and form. The path of stormwater is clearly articulated in an artful way through the use of visual and texture changes in local materials that contrast the large expanses of concrete paving within the space. Form fulfills the crucial role of unifying the plaza to the architecture in a way that creates one singular identity.

Meaning

As indicated in the coded graphic for this project (see Figure 2-25), two types of seating are present at Stephen Epler Hall – one coded as a safety component while the other a meaning component. Both provide users the opportunity to rest while observing the environ-

ment around them; however, the latter is pulled back against a wall and strategically placed beneath an overhead structure. The result is a place of "prospect and refuge" for the users. Few, if any, users would remain outside in the midst of a storm to observe and interact with the eco-technologies had the designer not oriented the site to the user in as great detail. Now, users have the opportunity to become attentive observers of the natural and hydrologic processes at work in the urban environment. Consequently, they gain knowledge and an understanding of how the ecology is performing to better their quality of life. This is currently happening at Stephen Epler Hall. "According to the designers, students emerge from the dormitory during storms to watch the rainwater show" (Echols and Pennypacker 2008, 276). Ultimately, these students have the potential to become "dynamic users" as they advocate for the ongoing maintenance and repair needed to keep the urban ecology thriving indefinitely into the future. This is the true path to resiliency.

Conclusion

Using the proposed framework as a metric for determining the probable resiliency of this project is not appropriate given that the framework is currently defined around the design of streets. Nonetheless, Stephen Epler Hall offers tremendous insight into how designers can program stormwater infrastructure within the urban right-of-way to reinforce the important role of the user as a component of the site. The argument could be raised that there is simply not enough space within a given right-of-way to incorporate meaning components into the design. I would contend that there is no one solution for designing meaning. Therefore, we should not look to overhead structures as the panacea for obtaining resiliency. Instead, designers should begin their design process with the end goal of meaning in mind looking for opportunities throughout site analysis and design development with which they can increase the right-of-way's level of user orientation.



Figure 2-27: Educational signage. (photographed by Lorn Clement)

In some cases, such as South Grand, the narrow right-of-way width might mean completing an analysis of adjacent, underutilized parcels that could be suitable for a small, urban park or plaza similar in size to this precedent.



Figure 2-28: View of local materiality used to accent the path of stormwater from the residence hall to the sunken infiltration planter. (courtesy of BES)

Site Inventory + Analysis

methodology

During the precedent study, the theoretical framework established a set of criteria with which to evaluate three precedent projects and one existing place. Because of its utility, the framework was employed for organizing the site inventory and analysis; however, this time, it was used as a point of departure for generating specific methods rather than serving as a metric for evaluation.

Seeking to maintain the hierarchical ordering within the proposed framework, the site analysis methodology consistently categorizes each of its steps into the five framework divisions of function, safety, ecology, genius loci, and meaning. In this way, landscape architects and urban planners can look to this report on South Grand as a guide for which type of analysis questions they should ask depending on where their project is intended to hit upon the framework. If your end goal is to design a “complete street,” there is little to no reason for you to spend time analyzing hydrological watersheds and existing impervious surfaces. These are two examples of site analysis tasks found within the ecology level of the proposed framework. Only in designing a “green street,” “destination street,” or “resilient street” would you address these tasks. Higher level analysis is not needed for a lower level design.

The diagram to the right (see Figure 2-29) abstractly illustrates the overall process for deriving the end tasks needed to complete a user-oriented site analysis for South Grand Boulevard. A user analysis for each level of the theoretical framework establishes the scope and ideal user group in which to determine specific project goals. At the function level, the primary users are motorists who desire efficient passage through the site as a means of getting from one place to another. At the safety level, all users have equal importance and programmatic emphasis whether they are motorists, public transit commuters, pedestrians, people with disabilities, or cyclists. At the ecology level, all human beings are considered users in close relation to the natural environment on which we depend for our continued existence. Our ac-

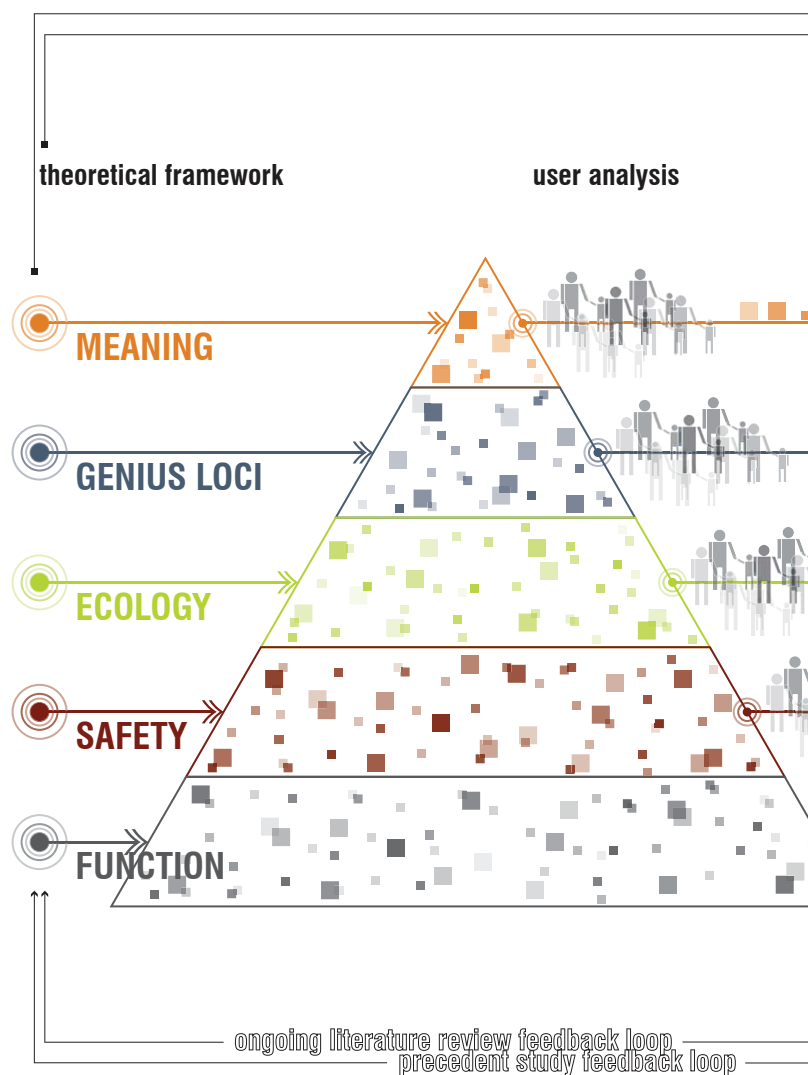
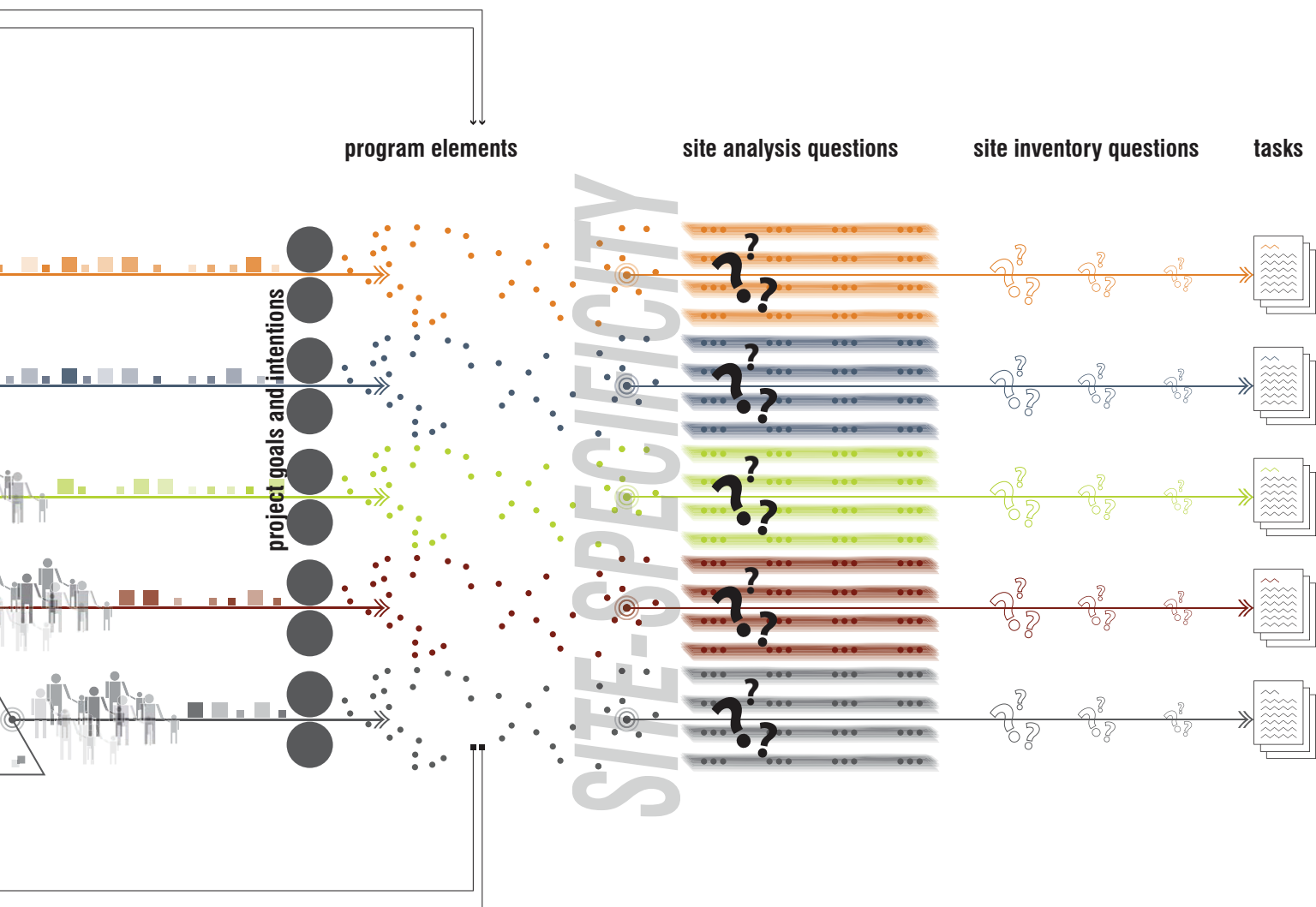


Figure 2-29: Site inventory and analysis methodology diagram. (created by author)



tions toward ecology today have a direct impact on the quality of life for future generations of human beings, as well as, other plant and animal species. At the genius loci level, a community of users embraces a similar identity centered around a unique place. Finally, at the meaning level, users become dynamic components of the urban right-of-way. Assuming ownership of the public space, these motivated users look daily for opportunities to educate other visiting users of the ecological processes present at South Grand.

Following the user analysis, three project goals were selected for each level of the framework (see Figure 2-30). While these goals would eventually be used to guide the conceptual thinking for design explorations, they served an immediate function to break down the subcomponents of each level of the framework for the development of site appropriate programmatic elements. An ongoing literature review and precedent study feedback loop aided in the selection of additional programmatic elements for South Grand. The next step in the methodology formalized specific analysis questions that related and referenced the given user group, project goals, and programmatic elements to South Grand as an existing site. In many cases, these questions were quite complex requiring the formalization of subsequent inventory questions to further delineate an appropriate path of inquiry into answering the original question. In the end, task sheets outlining the inputs, source data, methods, and potential outputs were assembled to guide the production work of South Grand's inventory and analysis.



Figure 2-30: Site inventory and analysis process map. (created by author)

site analysis questions

- What user amenities can be **spatially associated** with stormwater eco-technologies with the goal of promoting a "meaningful" user experience of the site's natural systems?

- Which areas of the site comprise the most suitable **context for learning** in terms of visibility, opportunity for gathering, and potential for interactivity?

- How can the design of South Grand use "artful rainwater design" to create a new **progressive identity** for the district while respecting the **historic and ethnic** character of the community?

- Which sidewalk areas are most suitable for **outdoor dining** based upon existing use, setbacks, land use, and views toward important district identifiers?

- How much **sidewalk space** can be allocated to stormwater eco-technologies without sacrificing user circulation or safety (public health, safety, and welfare) in this site?

- Which **eco-technologies** can be adapted from precedent studies of other right-of-way projects, and where are they best incorporated into the existing urban fabric along South Grand?

- Which **existing street trees** should be preserved in the final design proposal?

- Which components of the existing urban right-of-way present **potential safety hazards** to users (pedestrians, cyclist, special needs, commuters, etc.) other than motorists?

- Where is additional **street lighting** needed to provide all intersections with 2 fc of light intensity and 1 fc along the length of the street?

- Where are **bus stop locations** most appropriate in terms of safety, surrounding land use, and proximity to largest number of users?

- Where is **bike parking** most suitable along South Grand according to adjacent building use, observed cycling destinations, and other associated bike amenities (public restrooms, drinking fountains, etc.)?

- Which **vehicular lane configuration** provides the optimal balance between traveling motorist needs and the community's desire to become a **destination** rather than a thoroughfare?

- Where are existing utilities located in relation to limestone building foundations?

site inventory questions

- Which natural systems can be reintroduced into the urban context?

- Where on site can users observe "artful" stormwater runoff and be protected during rain showers so as to not put them in harm's way or cause discomfort?

- What property adjacent to South Grand is most suitable for redevelopment into a small urban outdoor classroom?

- How close is the location to existing schools within a 1 mile radius?

- What is the potential for this site to handle stormwater from adjacent property and/or include a vertical garden?

- What components of the existing community's historical identity should be preserved and further articulated in the new design proposal?

- What is the identity or composition (land use, iconic elements, demographics, materiality, etc.) of each city block in the project area facing South Grand? Are certain blocks hierarchically more important than others?

- What is the ethnic population breakdown surrounding the project area?

- What are local material palettes for the St. Louis City area?

- What are other competing community business districts in the greater St. Louis City metropolitan area?

- Which sites are most suitable for locally commissioned pieces of public art along South Grand?

- How do you maximize pedestrian sidewalk and amenity space while not reducing the vehicular parking capacity?

- How many on-street parking stalls currently exist?

- How does the hydrological cycle currently take place on site?

- What other natural systems are important to take into consideration?

- What is the threshold of determining how valuable an existing street tree is?

- Which intersection(s) has the highest traffic accident injury/fatality rating?

- What are the "high-traffic" volume times of the day for each user group? What are the existing user groups?

- Which existing stops need to include more amenities (such as a bus shelter) based upon current ridership levels?

- What amenities are associated with bus stops?

- What are the potential vehicular lane configurations?

- How does the existing urban right-of-way function to provide users with efficient travel and circulation?

- What connections are essential to maintaining the functionality of the existing street?

- What are the needs of a traveling motorist?

- What is the average vehicular speed within the project site?

- What design guidelines are specified by AASHTO for vehicular circulation along a major arterial corridor?

- What are the components necessary to create a destination rather than vehicular thoroughfare?

- What vehicular speed is most often observed in historic business districts?

- How many parking stalls currently exist as on-street parking or immediately adjacent parking stalls?

tasks

- Needed Seating Analysis

- Property Utilization Map

- Context for Learning Suitability Analysis

- Outdoor Dining Analysis

- Historic Landmarks Map

- District Competition Map

- Public Art Analysis

- User Ethnicity Analysis

- Hydrology Analysis

- Impervious Surface Analysis

- Sidewalk Width Analysis

- Street Tree Analysis

- Eco-technology Suitability Analysis

- Intersection Safety Map

- Street Lighting Analysis

- Bus Stop Analysis

- Bicycle Amenity Analysis

- Vehicular Lane Analysis

- Existing Utilities and Infrastructure Analysis

- Land Use Map

- Vehicular Parking Analysis

SOUTH GRAND BOULEVARD

Compton Heights

Shenandoah Elementary School

Saint Luke's Church

B'nai El Congregation

Beauvais Manor on the Park

St. Andrews Episcopal-
Presbyterian Church

Missouri School for the Blind

Messiah Lutheran Church

Messiah Lutheran School

Tower Grove Park

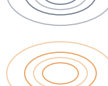
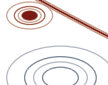
St. John's Episcopal Church

Fellowship Cent

61

SOUTH GRAND BOULEVARD: user orientation as a catalyst for resiliency

LEGEND:



Major Arterial Street

Cross Street

Bus Routes

Bike Lanes

Existing Shared Traffic Lanes

Distance Indicator

Bus Stop Average Daily Ridership

Public Parks

Institutional Preservation and Development Area

Neighborhood Commercial Area

Specialty Mixed Use Area

National Historic District

Local Historic District

Bus Stop

National Historic Register

National Historic Landmark





Figure 2-31: Neighborhood context analysis. (created by author)

15



14



11



9



5

Utah St.

15

14

12

Humphrey St.

11

Wyoming St.

9

63

SOUTH GRAND BOULEVARD: user orientation as a catalyst for resiliency

South Grand Blvd.

16

13

10

8

12



10



13



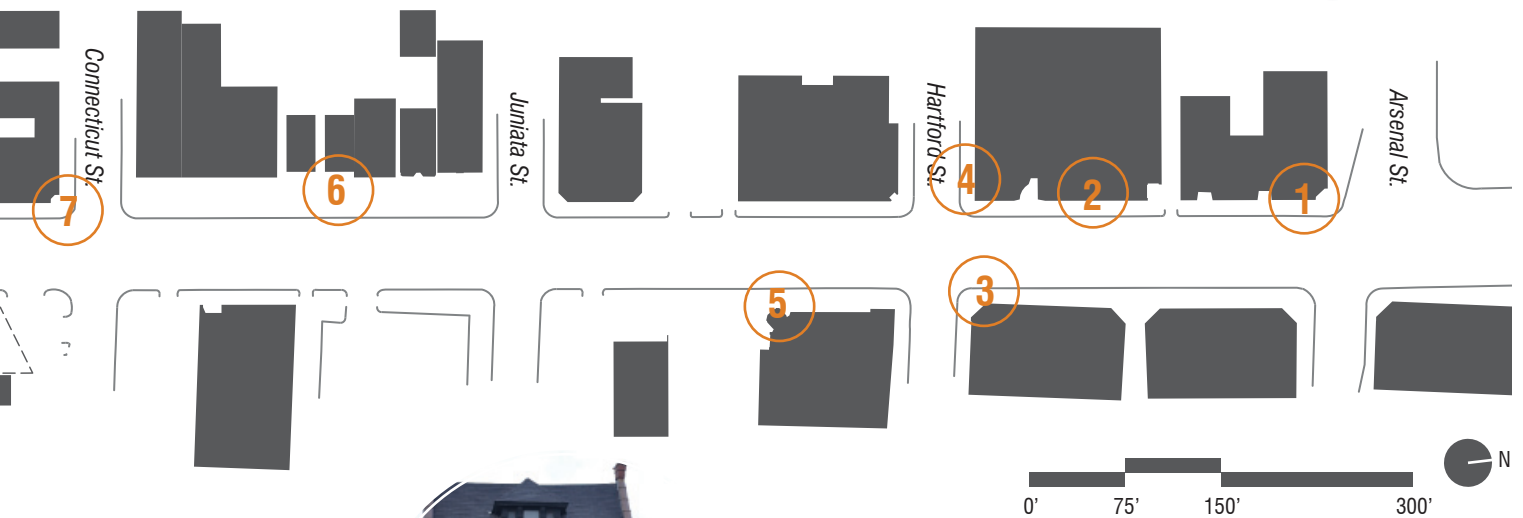
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7



Figure 2-32: Site imagery spatially referenced to illustrate unique character of each city block along South Grand. (created by author)



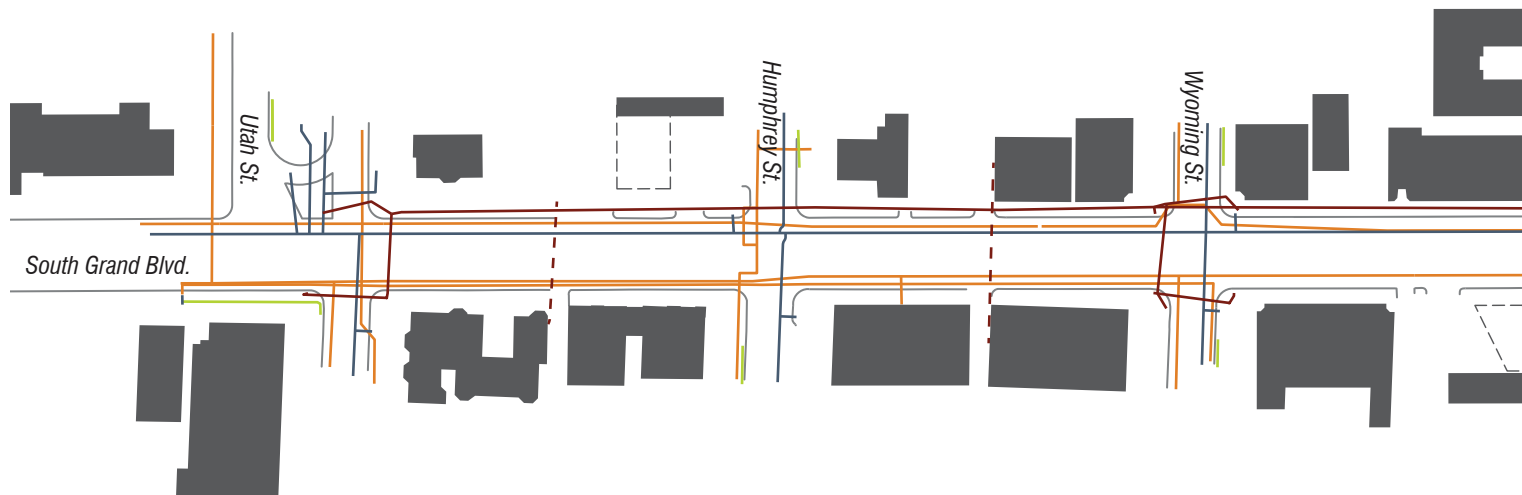


Figure 2-33: Map of existing utilities and related infrastructure. (created by author)

Legend:

—	Gas Pipes
—	Water Main Pipes
—	Underground Electrical Lines
—	Underground Light Lines
- - -	Overhead Electrical Lines
	Building Footprint
—	Roadway Curb
- - -	Overhead Canopy

Function

existing utilities and infrastructure analysis

General Information

Whether undertaking a simple retrofit or the complete redesign of an existing urban right-of-way, it is extremely important to consider the location of existing utilities and any related infrastructure. Along South Grand Boulevard, existing utilities include gas pipes, water main pipes, combined sewer pipes, underground electrical lines, overhead electrical lines, and underground street lighting electrical lines. Figure 2-33 delineates the location of these utilities with the exception of the combined sewer. For clarity purposes, this utility is inventoried within the hydrology analysis (see page 77). The inventory of these utilities came from a site survey provided by Design Workshop.

Opportunities

With the exception of buried electrical lines, all other utilities are located predominantly within the on-street parking zones of the street. Additionally, electrical lines are typically buried at a shallower depth in comparison to other utilities. This presents an opportunity to protect the building's limestone foundations with the inclusion of a concrete wet vault underneath the sidewalk. The wet vault would serve a dual role to capture and store excess stormwater runoff and act as a protective barrier to the existing limestone foundations. By replacing, not retrofitting, the existing sidewalk, a second opportunity presents itself for the placement of a heating element underneath the surface pavement. Using radiant heat to melt snow in the winter months will reduce the need for toxic chemicals and salts.

Constraints

One constraint identified during this analysis was the lack of information known about the depths of the existing utilities. MSD was contacted; however, due to security risks they could not give out specific information concerning the utilities. They did state, however, a general understanding of which utilities were typically buried lower than others.

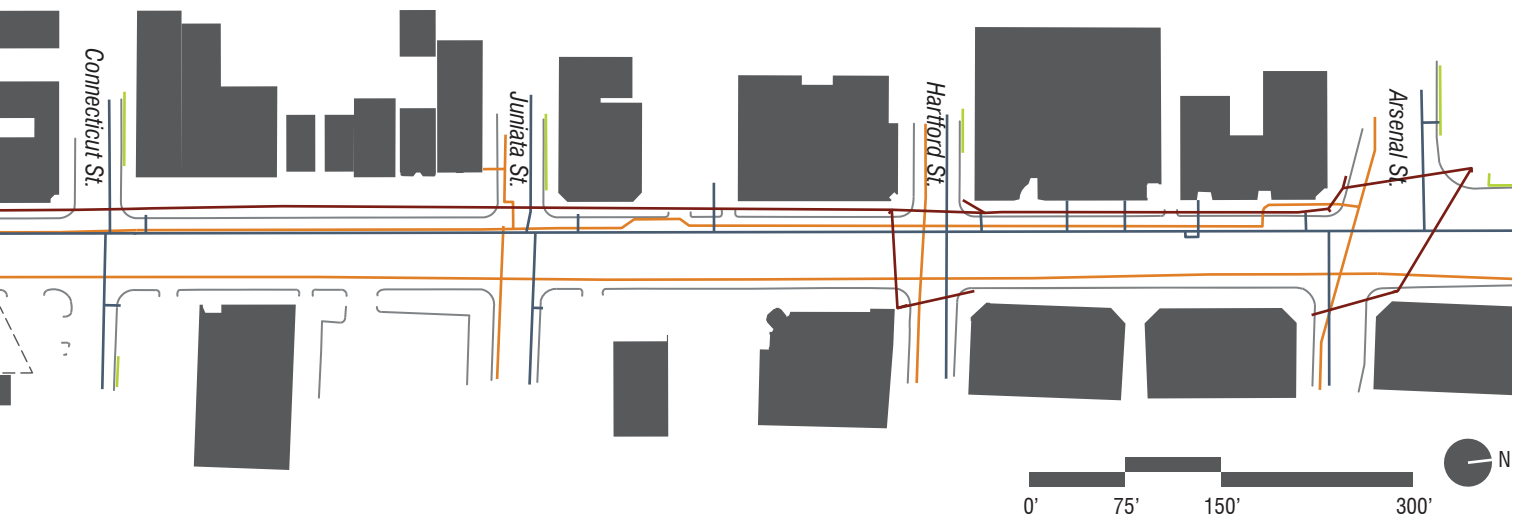


Figure 2-34: View down service alley where overhead electrical lines exist. (photographed by author)



Figure 2-35: Sewer manhole cover stating "no dumping, drains to stream." (photographed by Janice Ziegler)



Figure 2-36: Access point for gas pipes. (photographed by author)

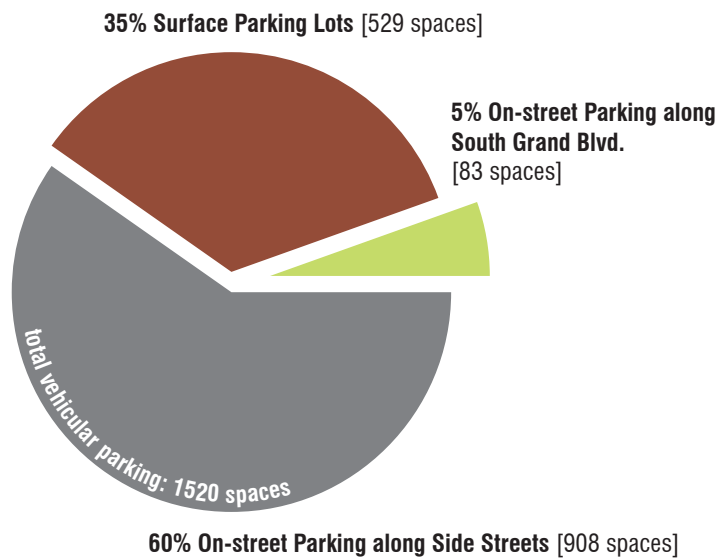


Figure 2-37: Pie graph of vehicular parking types at South Grand. (data courtesy of Design Workshop; graphic created by author)

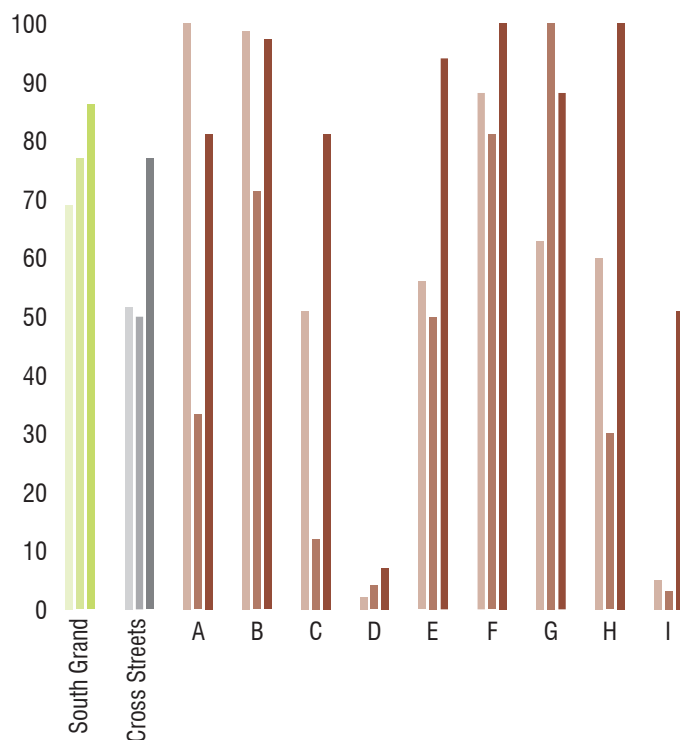


Figure 2-38: Bar graph of vehicular parking utilization rates for weekday midday, weekday evening, and friday night times respectively. (data courtesy of Design Workshop; graphic created by author)

vehicular parking analysis

General Information

In South Grand's transition from a largely auto-oriented district to a walkable place, the analysis of vehicular parking utilization rates proves useful in supporting design decisions with quantifiable data as to why some existing vehicular parking might be lost. The data represented within this analysis was extracted from tables found within Design Workshop's master plan booklet for South Grand. Figures 2-39, 2-40, and 2-41 display the collected data in a comparative way. One can observe how the vehicular parking utilization rates change depending on time of day and week.

Opportunities

Surface parking lots "C" and "D" offer the district a combined total of 208 parking stalls. As indicated by their low utilization rates (see Figure 2-38), these parking lots are two of the most underused lots adjacent to South Grand Boulevard. A redesign of these lots into a single district-wide shared parking lot could help promote the district as a walkable destination. With proper wayfinding and signage, users can easily park their vehicles and walk to any and all of their desired destinations within the district.

Vehicular parking utilization rates prove to be a valuable resource in determining the selection of a directly adjacent parcel for its redevelopment into an educational pocket park. Surface parking lot "H" fails to be utilized over 69% during the week until Friday evening. Additionally, it contains only 10 parking spaces indicating that its redevelopment could pose the least overall impact on the district's parking capacity.

Constraints

Figure 2-37 displays the percentages of vehicular parking types for South Grand. On-street parking along South Grand comprises only 5% of the total capacity. Surprisingly, all of the surface parking lots together comprise only 35% of the total capacity. The remaining 60% is found along the residentially fronted side streets.

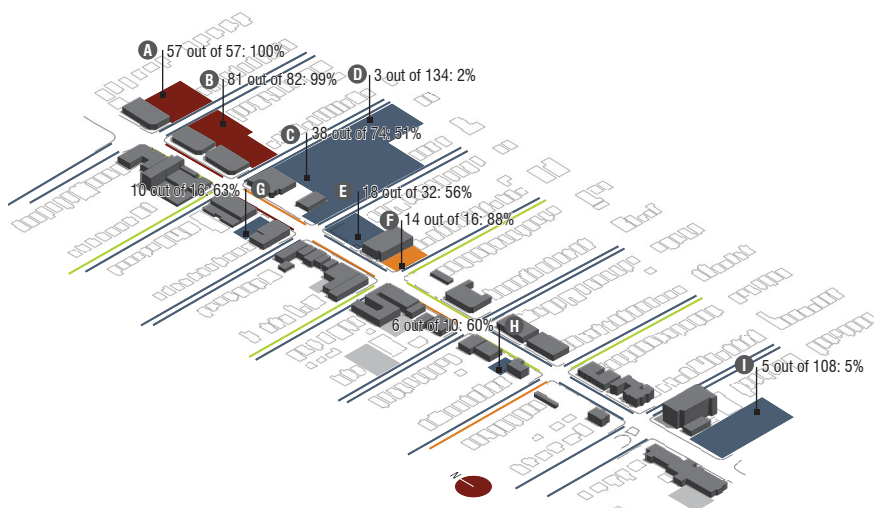


Figure 2-39: Weekday vehicular parking conditions at midday. (created by author)

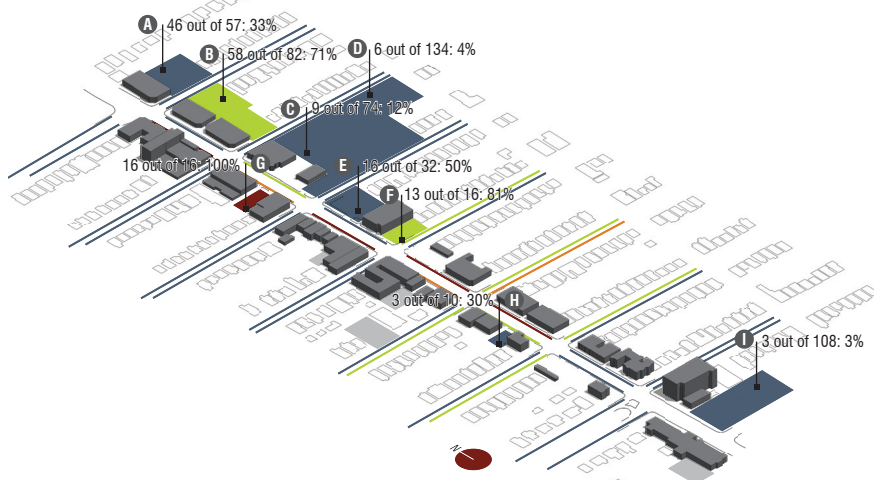


Figure 2-40: Weekday vehicular parking conditions during evening hours. (created by author)

Legend:

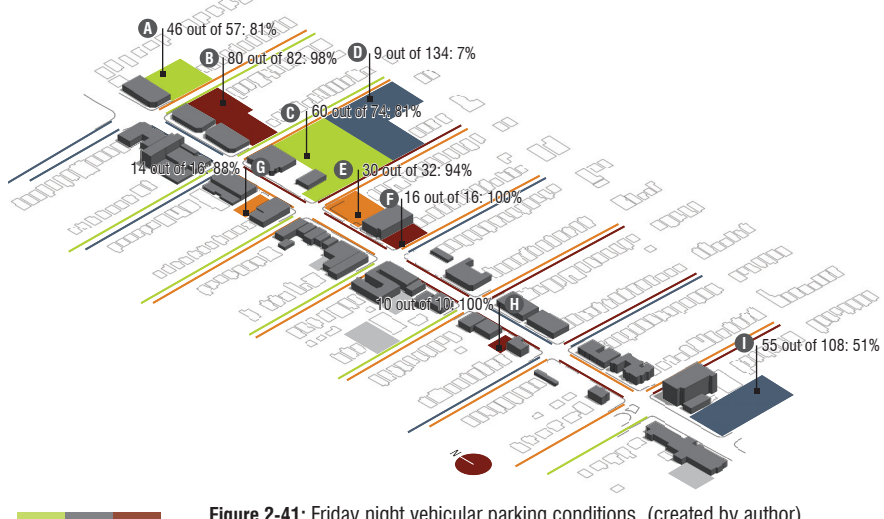
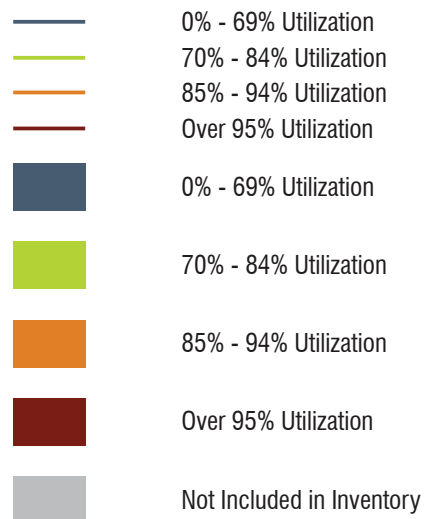


Figure 2-41: Friday night vehicular parking conditions. (created by author)

vehicular circulation and node analysis

General Information

The primary, secondary, and service vehicular circulation routes represented in Figure 2-42 are indicative of the site conditions prior to Design Workshop's 30-day pilot test of their 3-lane concept. The addition of the vertical text callouts identify the current businesses along South Grand Boulevard.

Opportunities

As the design proposal for South Grand will largely address the urban right-of-way, the users' sense of arrival and departure within the district will generally take place at the street intersections where nodes of disparate activities meet. These nodes act as threshold spaces for how a user might be intrigued to enter and/or leave the district. The design of these spaces should offer both cohesion, so as to delineate the extents of the district, and subtle differences to allow users varying experiences depending on which node they enter or exit through. Anchoring either end of the district are the primary nodes at the Arsenal Street and Utah Street intersections. The design of these nodes should address their role as the primary gateways into and out of the district.

Another opportunity exists in closing some of the service alley entrances fronting South Grand Boulevard. This action would reduce the number of vehicular conflicts within the narrow right-of-way and allow greater amounts of space to be given to the pedestrian realm.

Constraints

Figure 2-42 reveals an astonishing discovery of varying land values from one side of South Grand Boulevard to the other. Clearly the darker parcel values on the west side are higher in value than the lighter colored parcels on the east side. This is surprising as few discrepancies could be observed in the visual characteristics of the surrounding neighborhoods during multiple site visits.

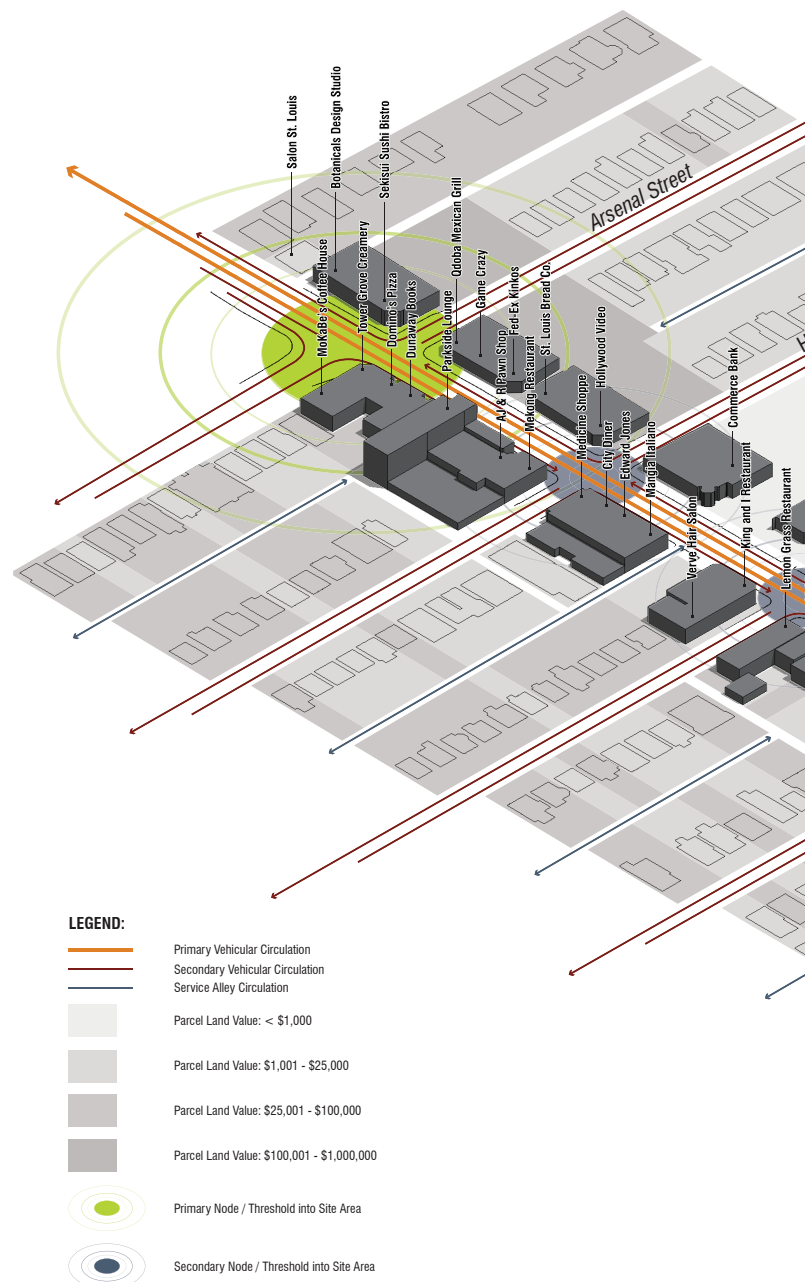
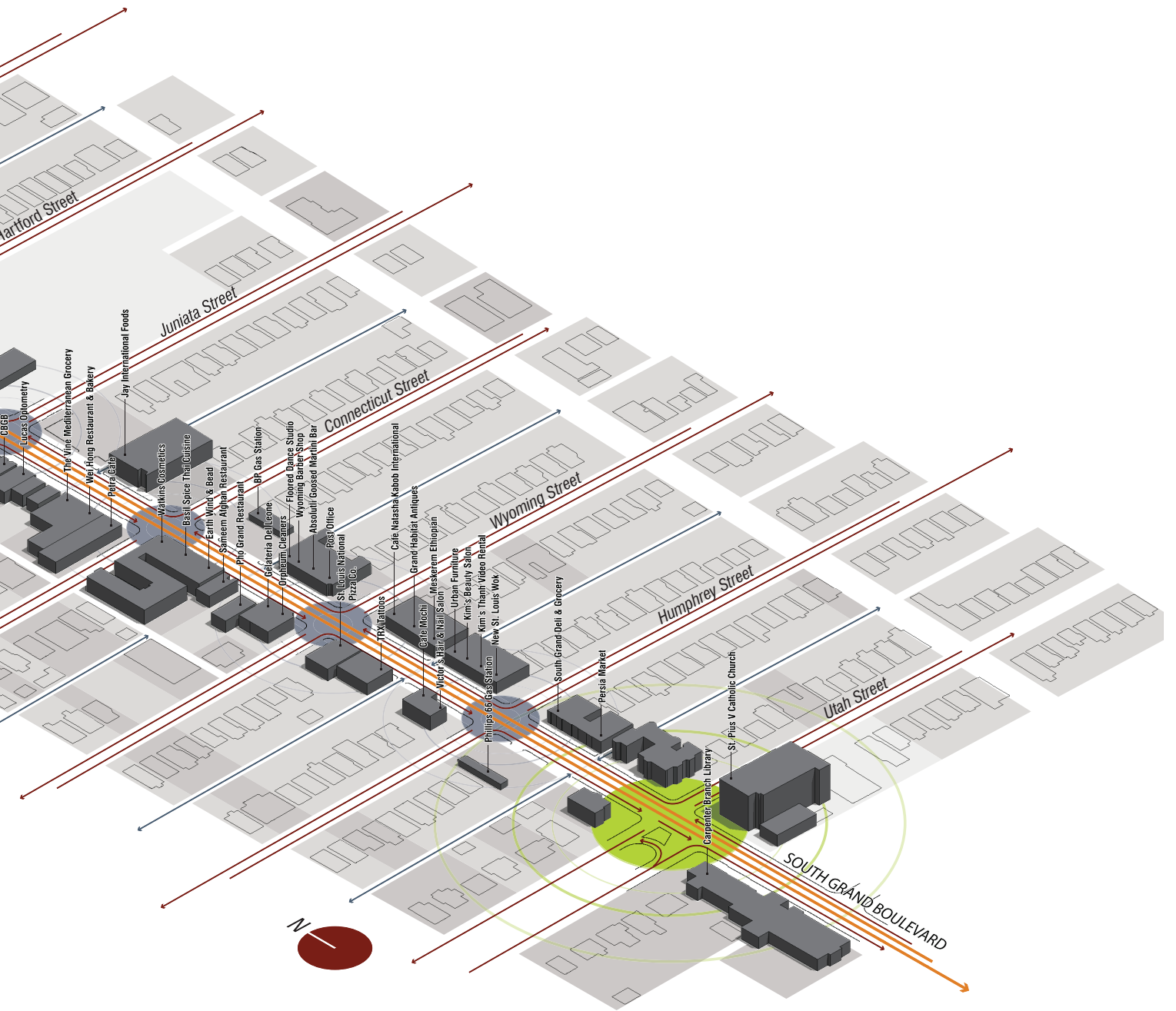


Figure 2-42: Vehicular circulation analysis indicating key nodes where thresholds exist for entering and leaving the site. (created by author)



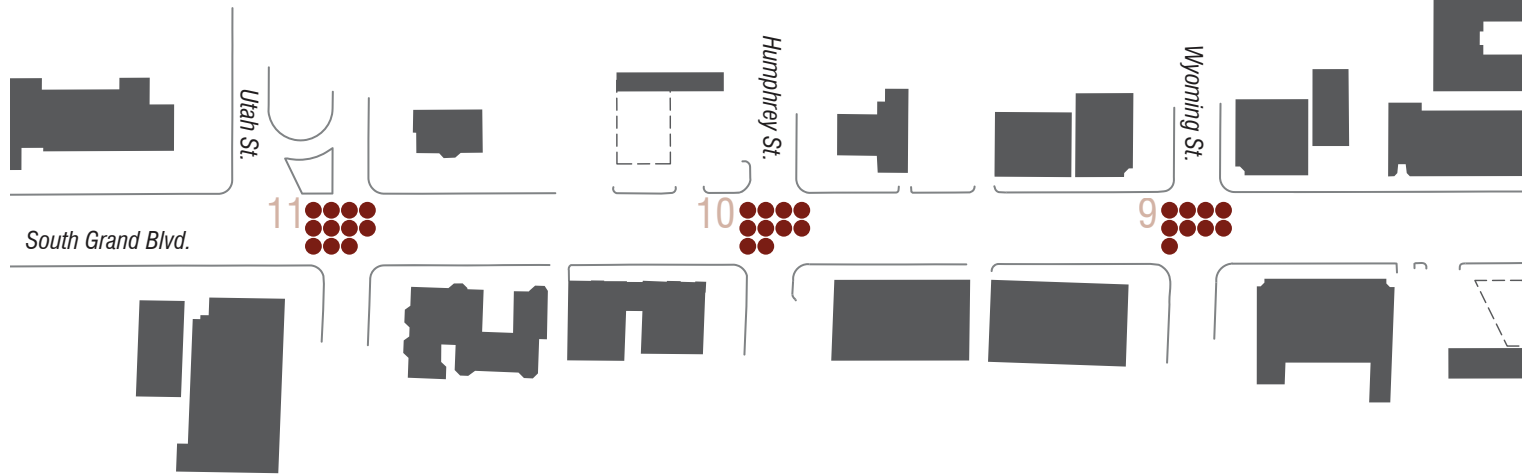


Figure 2-43: Intersection safety map referencing the average annual number of traffic accidents per each intersection. (adapted from Design Workshop)

Legend:

- Average Annual Traffic Accidents
- Building Footprint
- Roadway Curb
- Overhead Canopy

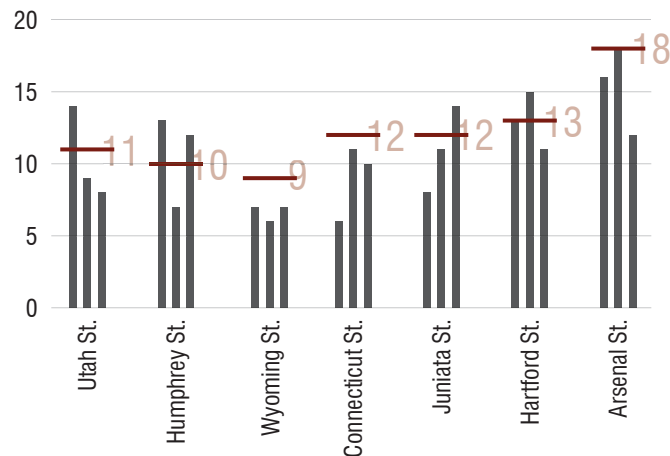


Figure 2-44: Bar graph of annual traffic accidents for 2007, 2008, and 2009, respectively. (adapted from Design Workshop)

Safety

intersection safety analysis

General Information

This analysis focuses on the annual number of traffic accidents per intersection. Both the data used for this analysis and its particular representation are heavily borrowed from Design Workshop's master plan for South Grand. For further information about their study concerning traffic accident rates and related cost-benefit analyses, reference pages 23 and 24 of their master plan.

Opportunities

Safety must be addressed at each intersection located within the business district. During the 30-day pilot test of Design Workshop's 3-lane configuration, 85% of vehicles traveled at an average speed of 32 mph throughout the district. With a target design speed of 25 mph, the mere inclusion of curb bulb-outs at the intersections is not enough to slow down vehicular travel. Furthermore, as evidenced in Figures 2-45 and 2-46, pedestrians frequently cross the street at locations other than designated crosswalks. These occurrences can cause disruption in vehicular traffic flow and increase the likelihood of harm coming to unprotected pedestrians within the traffic lanes. For these reasons, the strategic incorporation of raised intersections with pavements of contrasting color and texture could provide both a reduction in vehicular speed and encourage pedestrians to cross at the intended crosswalks.

Constraints

As already acknowledged, to improve intersection safety, the average vehicular speed must decrease within the district. Unfortunately, other portions of South Grand Boulevard have higher speed limits than that of the project site. This can be observed in part by the increased number of traffic accidents at the Arsenal Street intersection. While the odd alignment of the intersection may contribute to the higher rate of accidents, one can easily conclude that many people fail to slow to a proper speed when traveling south along South Grand Boulevard.

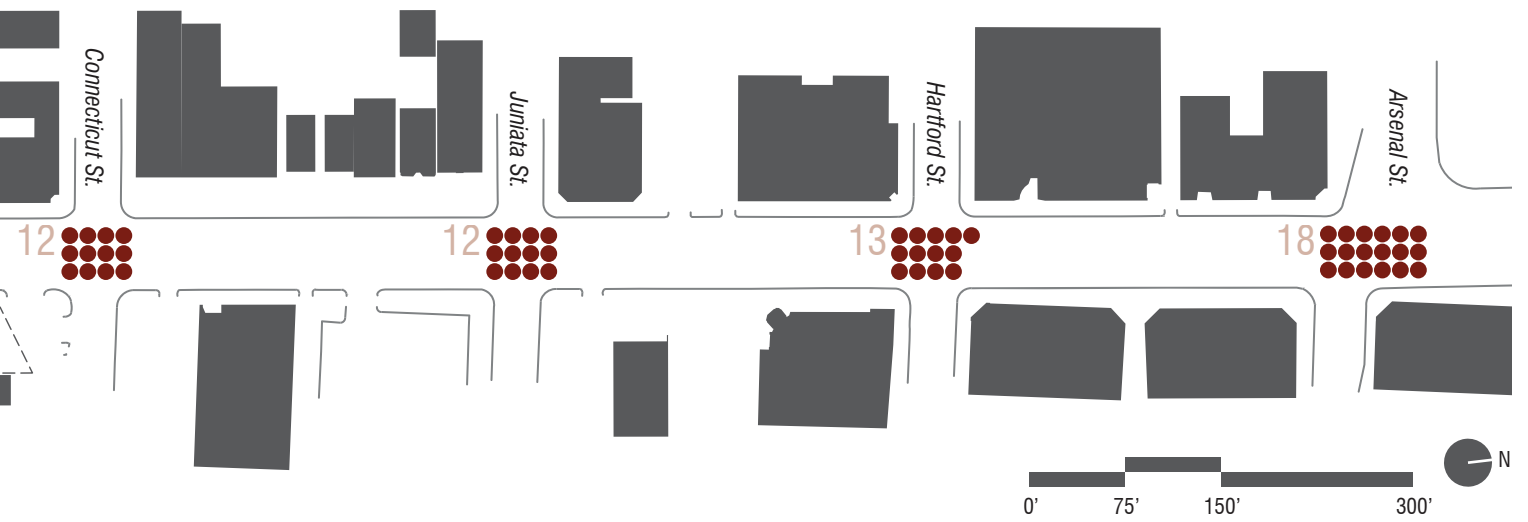


Figure 2-45: Couple fails to utilize the marked crosswalks at the Arsenal St. intersection. (photographed by author)



Figure 2-46: View of two pedestrians putting themselves in harm's way as a result of not crossing at marked crosswalks. (photographed by author)

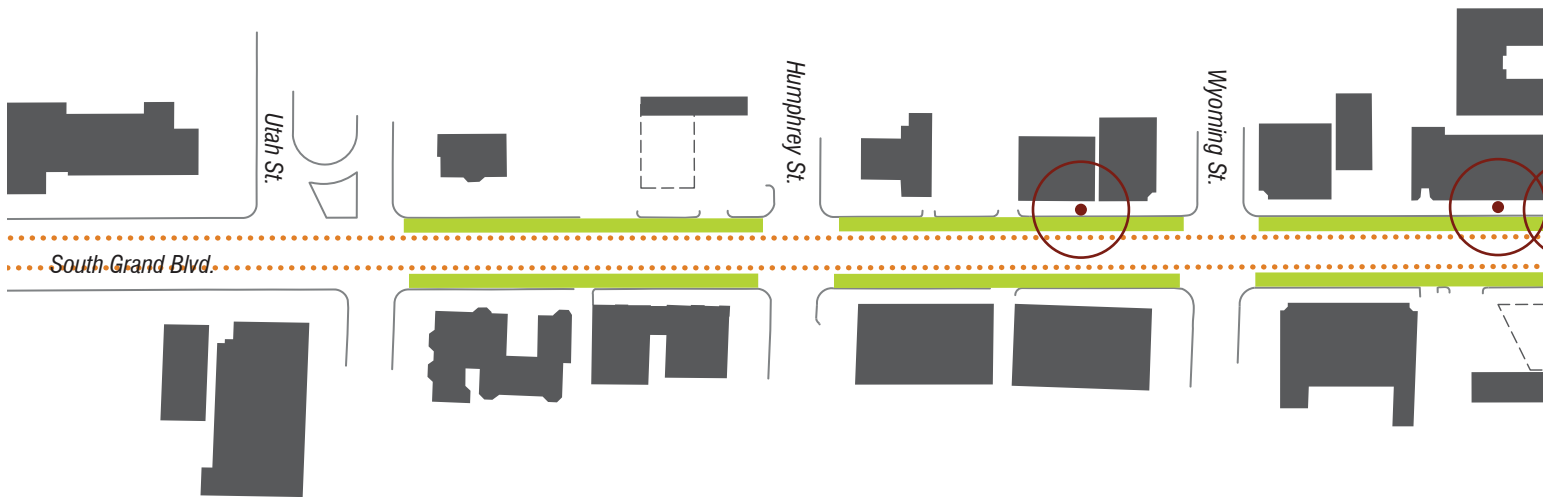
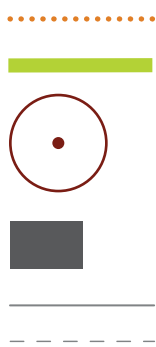


Figure 2-47: Bicycle amenity map. (created by author)

Legend:



- Bike Sharrows
- Suitable Bike Parking Area
- Location of Inappropriately Parked Bicycle
- Building Footprint
- Roadway Curb
- Overhead Canopy

bicycle amenity analysis

General Information

Currently, South Grand offers cyclists no bike parking or other amenities. Consequently, bicycles are chained to streets trees, fences, light posts, and other objects within the right-of-way that are conveniently located. The red circles within Figure 2-47 indicate the specific location of unaccompanied bicycles that were observed to be chained to inappropriate objects. Figures 2-49 and 2-50 clearly show the poor visual qualities of the parked bicycles along the sidewalk. These observations were recorded over two separate site visits during the fall of 2010 – one on the 15th of September and the other on the 2nd of October.

Opportunities

From this analysis, two design opportunities present potential solutions for the unsightly appearance of multiple bicycles being left haphazardly within the sidewalk zone. First, bike parking can be accommodated within the on-street, vehicular parking stalls. The reduction of one or two vehicular parking stalls per block would provide ample space for a dispersion of bike parking. Second, the inclusion of bike sharrows would offer the cyclist an opportunity to ride safely alongside vehicular traffic allowing the pedestrians on the sidewalk to remain out of harm's way. Additionally, the sharrows would allow the district to connect to existing bike lanes directly north while providing the greatest amount of sidewalk space for pedestrians.

Constraints

Two constraints are evident within this analysis. First, the existing sidewalk conditions are quite narrow and therefore unable to accommodate bike parking. Second, while bike parking could be incorporated into the on-street, vehicular traffic lanes, many local businesses would likely frown upon any reduction in vehicular parking capacity.

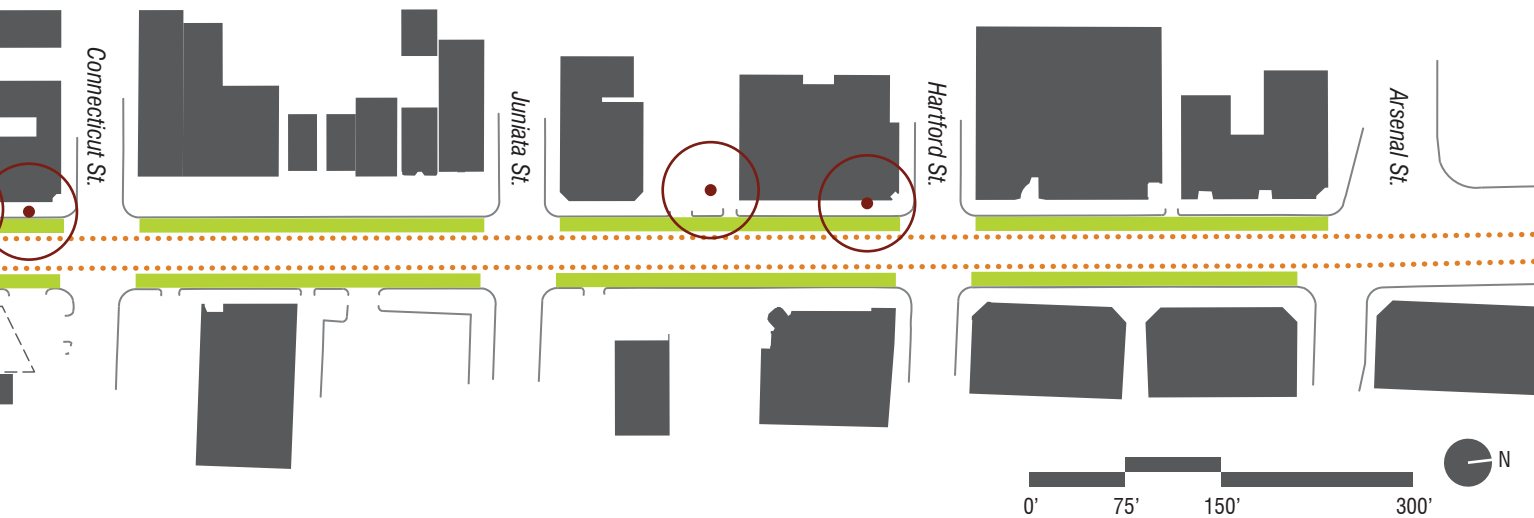


Figure 2-48: Narrow width of existing sidewalk does not allow adequate space for both stormwater planters and bike parking. (photographed and created by author)



Figure 2-49: Two bicycles chained to same street tree. (photographed by Janice Ziegler)



Figure 2-50: Tandem bicycle chained to street tree. (photographed by Janice Ziegler)

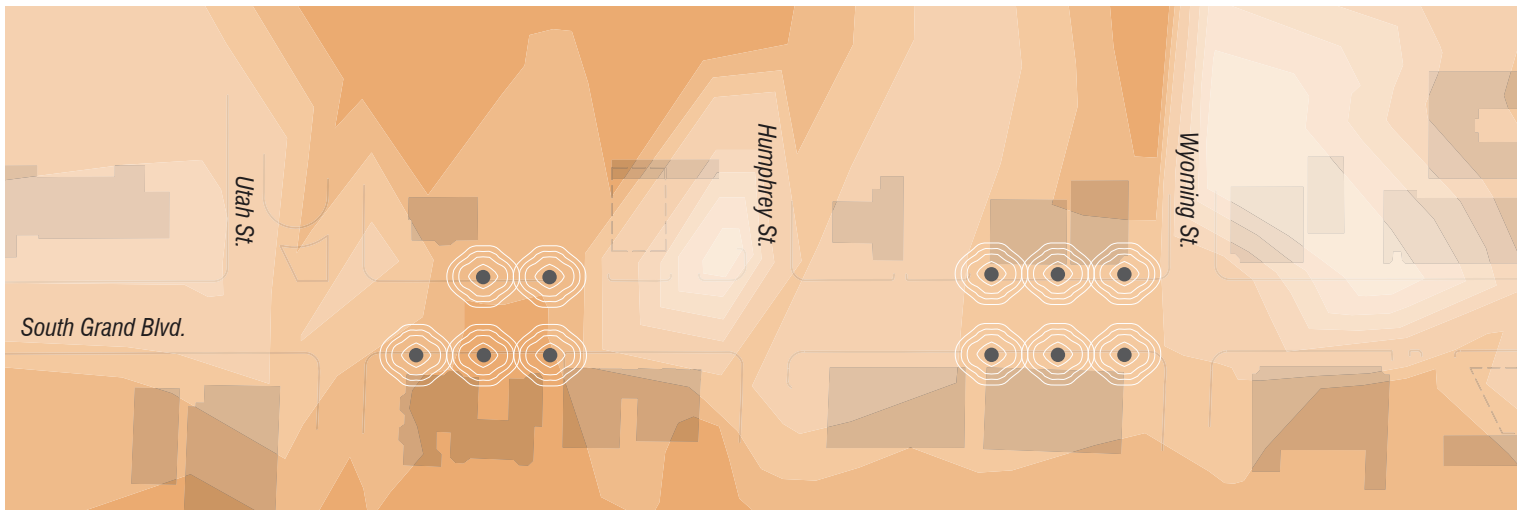
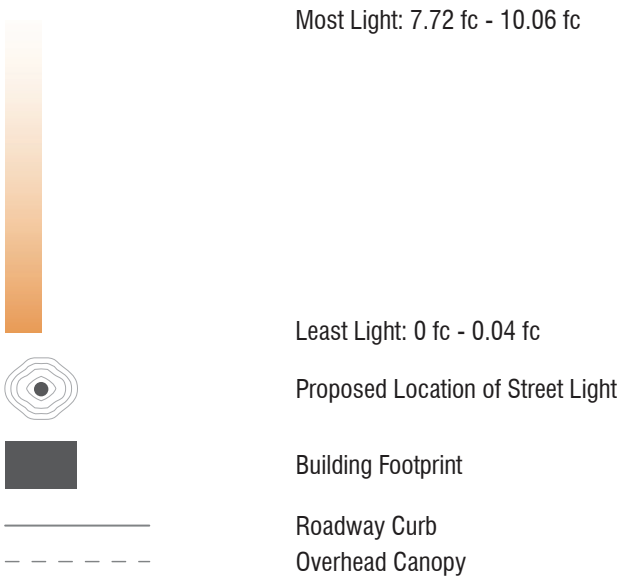


Figure 2-51: Street lighting analysis map. (lighting inventory adapted from Design Workshop; analysis of proposed lighting created by author)

Legend:



street lighting analysis

General Information

Through the use of hand-held light meters, Design Workshop inventoried light intensity levels across the project site. Within their master plan document, they articulate target light level goals of 1 f.c. along the streets and 2 f.c. at each intersection. As a critical component of nighttime safety, their light level data and goals have been incorporated into this report.

In breaking down the inventoried data, one can easily observe areas where under-lighting and over-lighting currently exist. Under-lit areas occur along a majority of the street frontage from Hartford Street to Connecticut Street. Additional under-lit areas include approximately half of each of the two blocks from Wyoming Street to Utah Street (see Figure 2-51). Over-lit areas include the parking lot behind Hollywood Video on the east side of the Hartford Street intersection, street frontage directly in front of the Sameem Afghan Restaurant between the Connecticut Street and Wyoming Street intersections, and the gas station located at the Humphrey Street intersection.

Opportunities

Figure 2-51 delineates the location of proposed lighting necessary to meet the goals stated above. Research into varying luminaires yielded the selection of an appropriate pedestrian-scaled luminaire, similar to the one proposed by Design Workshop. Referencing the manufacturer's specific isolux diagram for the selected luminaire, this analysis attempts to understand where lighting should be placed based upon existing light levels and the light intensity of a specific luminaire.

Constraints

The contrast of vehicular-scaled, utilitarian lighting and the pedestrian-scaled lighting exemplifies the district's ongoing struggle to function as a major arterial within the city of St. Louis while also identifying itself as a place (see Figure 2-53).

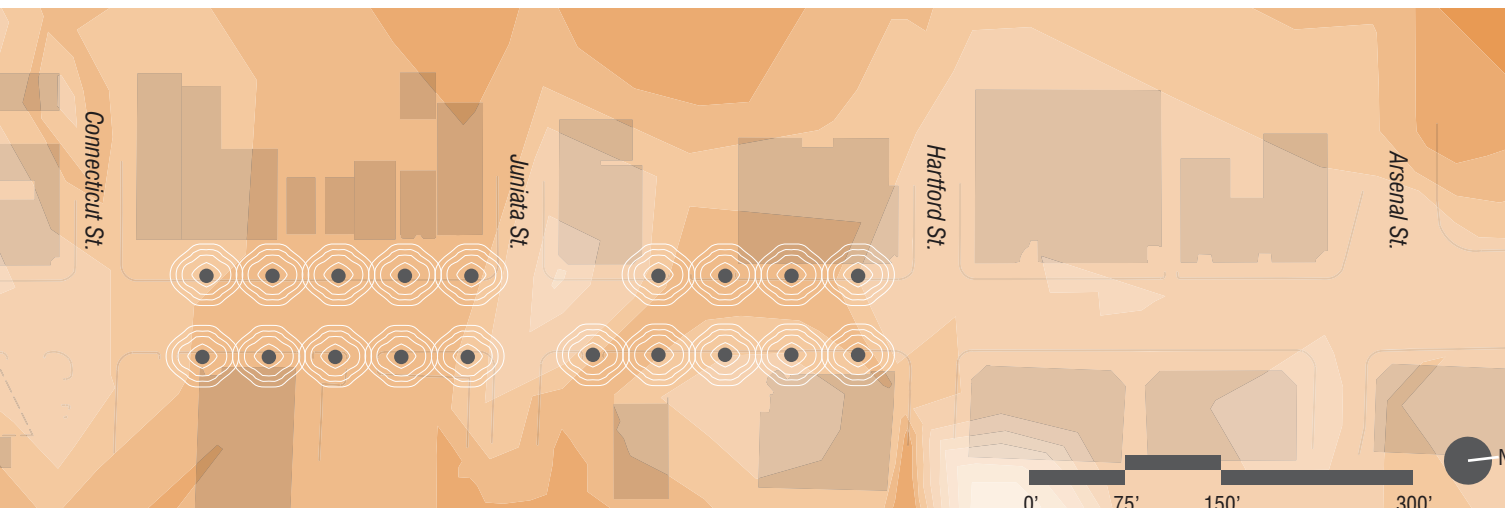


Figure 2-52: Detail of existing pedestrian-scaled lighting. (photographed by author)



Figure 2-53: Inconsistent use of pedestrian-scaled lighting alongside vehicular “cobra head” lighting throughout district. (photographed by author)

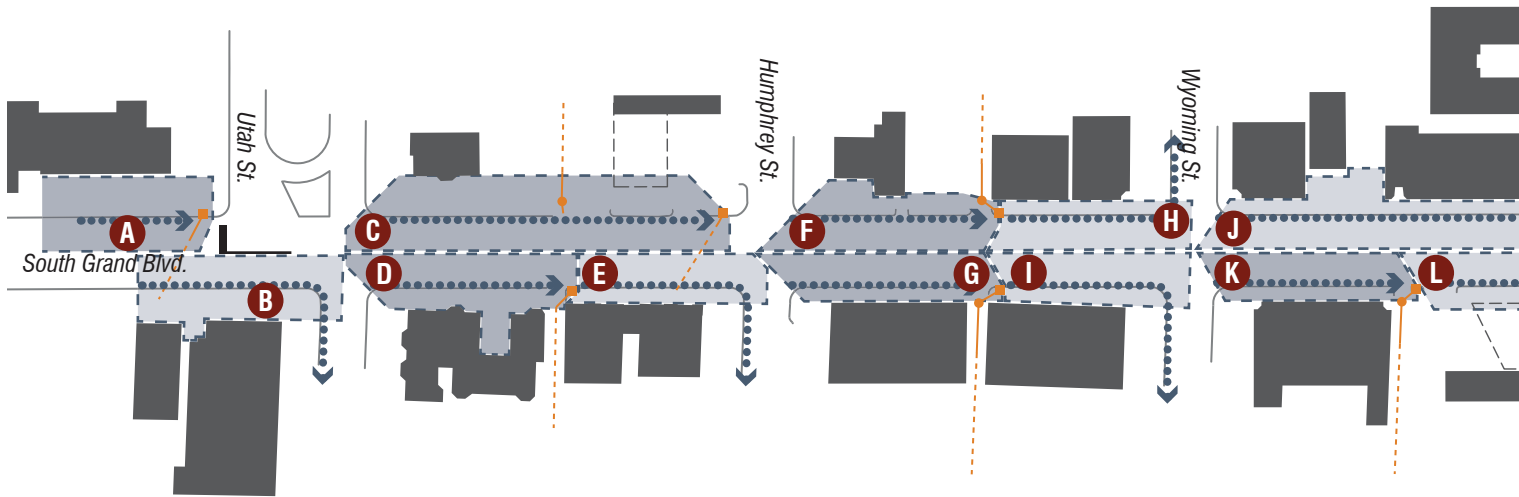


Figure 2-54: Hydrology analysis map delineating stormwater catchment areas and inlets. (created by author)

Legend:

	Flow Line
	Storm Sewer
	Estimated Storm Sewer
	Drain Inlet
	Manhole
	On-site Catchment
	Off-site Catchment
	Catchment Area Label
	Building Footprint
	Roadway Curb
	Overhead Canopy

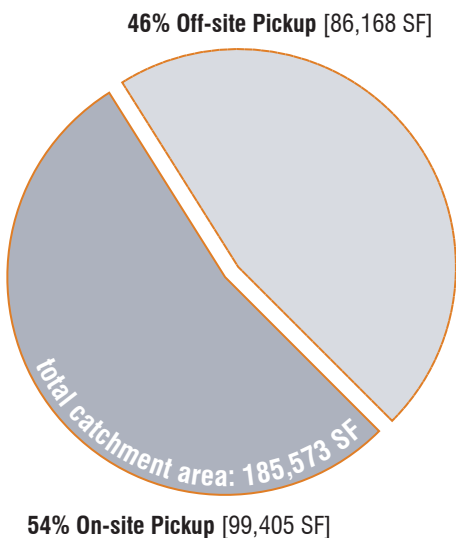


Figure 2-55: Hydrology catchment area pie graph. (created by author)

Ecology

hydrology analysis

General Information

At the ecology level of the proposed framework, designers must acquire a keen understanding of the site's hydrological systems. Figure 2-54 delineates the watershed catchment areas that are within the project site. These areas were derived from a close analysis of one foot contour data provided in the site survey. The dark blue arrows indicate the flow of concentrated water along the curb. A distinction is made between the catchment areas that contribute to the existing storm sewer on-site and those that contribute to it off-site.

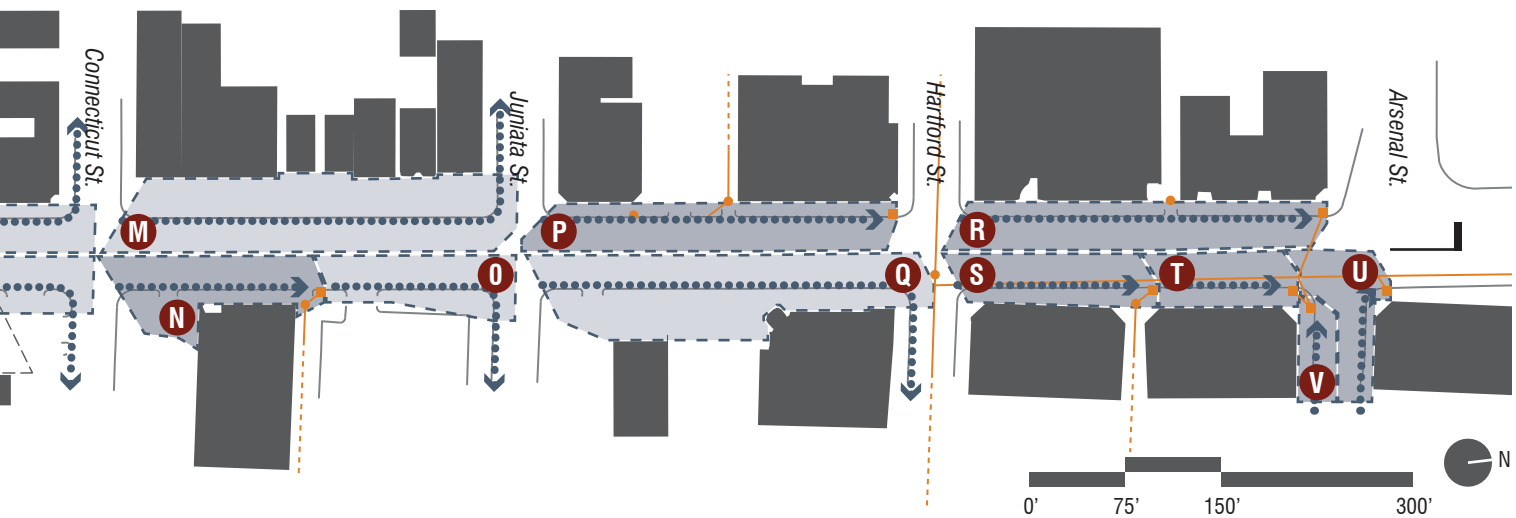
From this point, it is important to understand the amount of water flowing (or discharge) throughout each catchment area during a specified rainfall event. For the purposes of this analysis, the discharge and volume calculations listed in Figure 2-58 pertain to a 20 year, 20 minute storm event (see Appendix E). For a zero runoff condition (excluding contributions from rooftops), the total volume of water that must be handled is 18,352 cubic feet.

Opportunities

Knowing the total volume of water needed to be captured and infiltrated into the ground provides the opportunity to design stormwater eco-technologies that capture all of the runoff on-site. Furthermore, these eco-technologies can expand upon existing ideas within the "green streets" movement making the collection and conveyance of stormwater an amenity for the site. The "greening" of South Grand's grey infrastructure will promote beautification within the district and enhance its regional identity as a progressive, sophisticated place.

Constraints

When proposing new ideas for surface collection and conveyance systems, it is necessary to incorporate the existing storm sewer infrastructure. During occasional large storm events, the existing infrastructure will need to assist in the safe removal of excess stormwater.



CATCHMENT AREAS (CA)

A	9,438 SF
B	8,252 SF
C	16,090 SF
D	7,958 SF
E	5,627 SF
F	7,498 SF
G	6,259 SF
H	5,752 SF
I	5,960 SF
J	13,072 SF
K	5,737 SF
L	6,748 SF
M	17,834 SF
N	7,457 SF
O	6,329 SF
P	10,472 SF
Q	16,594 SF
R	10,540 SF
S	6,105 SF
T	4,663 SF
U	4,894 SF
V	2,294 SF

TOTAL: 185,573 SF

Figure 2-56: Bar graph of all catchment areas illustrating the relative size of each. (created by author)

CA DISCHARGE (CF/S) VOLUME (CF)

A	0.65	780
B	0.70	841
C	1.25	1,498
D	0.62	741
E	0.48	574
F	0.62	744
G	0.53	638
H	0.49	586
I	0.51	608
J	1.08	1,296
K	0.49	585
L	0.57	688
M	1.47	1,769
N	0.63	760
O	0.52	628
P	0.89	1,067
Q	1.37	1,646
R	0.90	1,074
S	0.52	622
T	0.40	475
U	0.42	499
V	0.20	234

TOTAL: 15.29 18,352

Figure 2-58: Discharge rates and cubic volumes for each catchment area. (created by author)

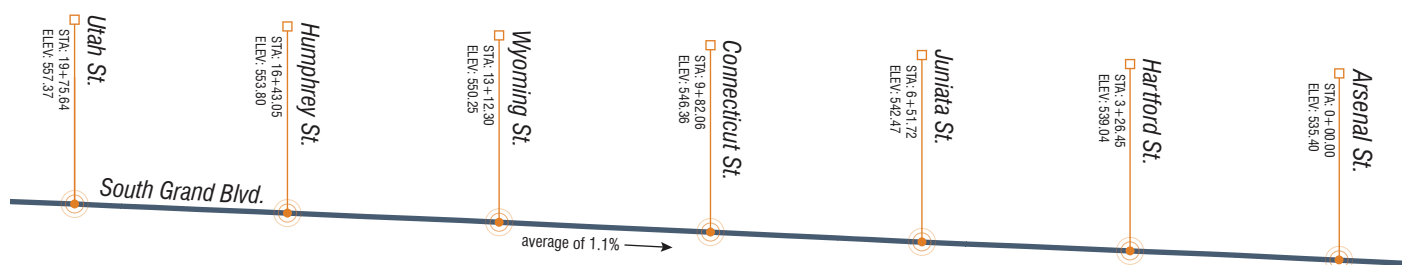


Figure 2-57: Longitudinal profile of South Grand Blvd. (created by author)

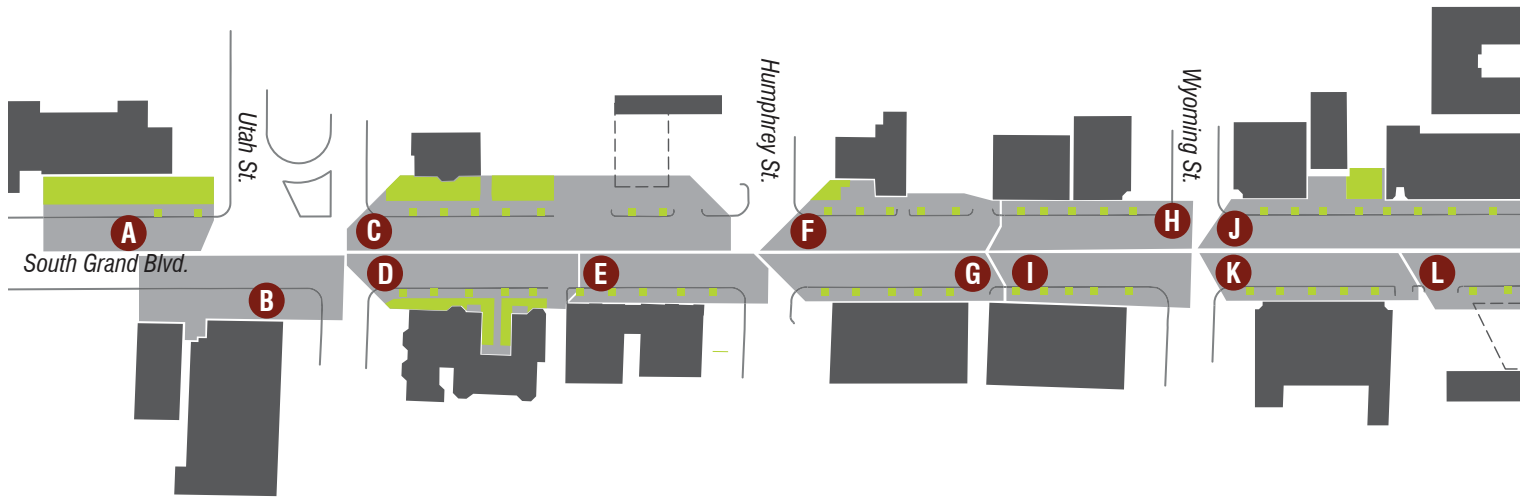


Figure 2-59: Impervious surface map. (created by author)

Legend:

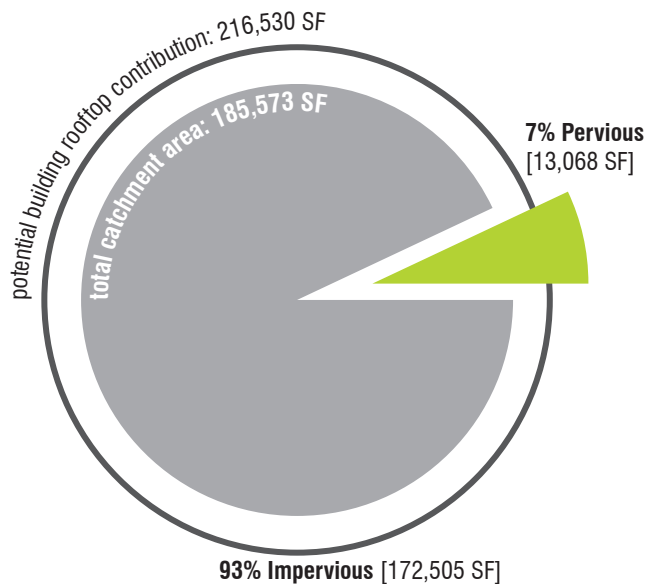
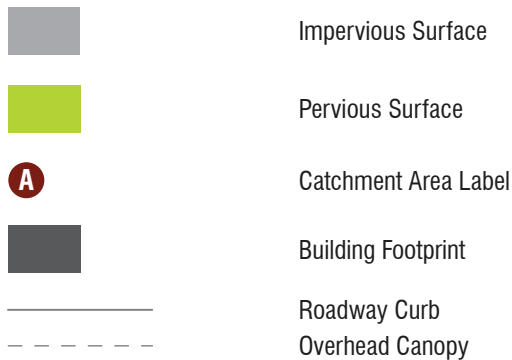


Figure 2-60: Pie graph of impervious vs. pervious surfaces. (created by author)

impervious surface analysis

General Information

After delineating the catchment areas within the hydrology analysis, the percentage of impervious surface within each catchment area was quantified in order to complete the discharge calculations. Figure 2-59 divides each catchment area into areas of pervious and impervious surfaces. For comparative purposes, Figure 2-61 represents the data collected within this analysis per each catchment area. As a result, critical observations are easy to comprehend, such as the greater amount of pervious surfaces located on the south end of the site as compared to the north end. Without knowing the existing land use, one can easily conclude based solely upon percentages of impervious surface that the corridor likely transitions from a commercial land use in the north to a more residential land use in the south.

Opportunities

Several opportunities result from this analysis. First, it will be possible to calculate how much stormwater runoff is reduced with the new design proposal. This will provide quantitative evidence arguing for the importance of introducing eco-technologies into the urban environment. Second, as indicated in Figure 2-61, the potential for capturing building rooftop runoff is quantified per catchment area. Though area "R" may not have the largest surface area, it has the potential to have the largest discharge if the adjacent buildings contribute the runoff from their roofs. Third, a significant opportunity for incorporating permeable pavements exists within the sidewalk and on-street parking stall areas.

Constraints

In order to increase and further enhance the perviousness of the project site, much of the existing vegetation, sidewalk pavements, and some soil volumes within the right-of-way will need to be removed for the placement of new eco-technologies.

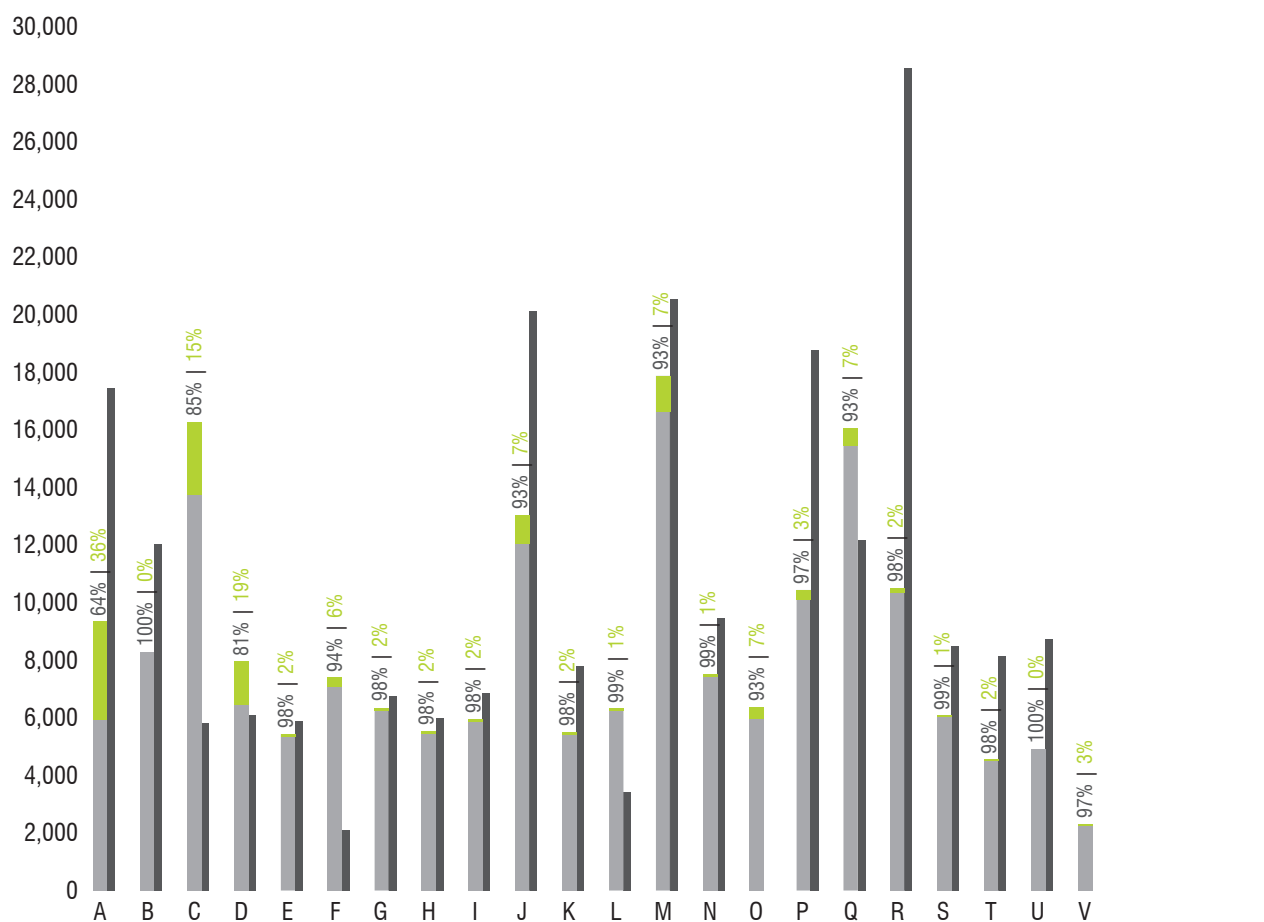
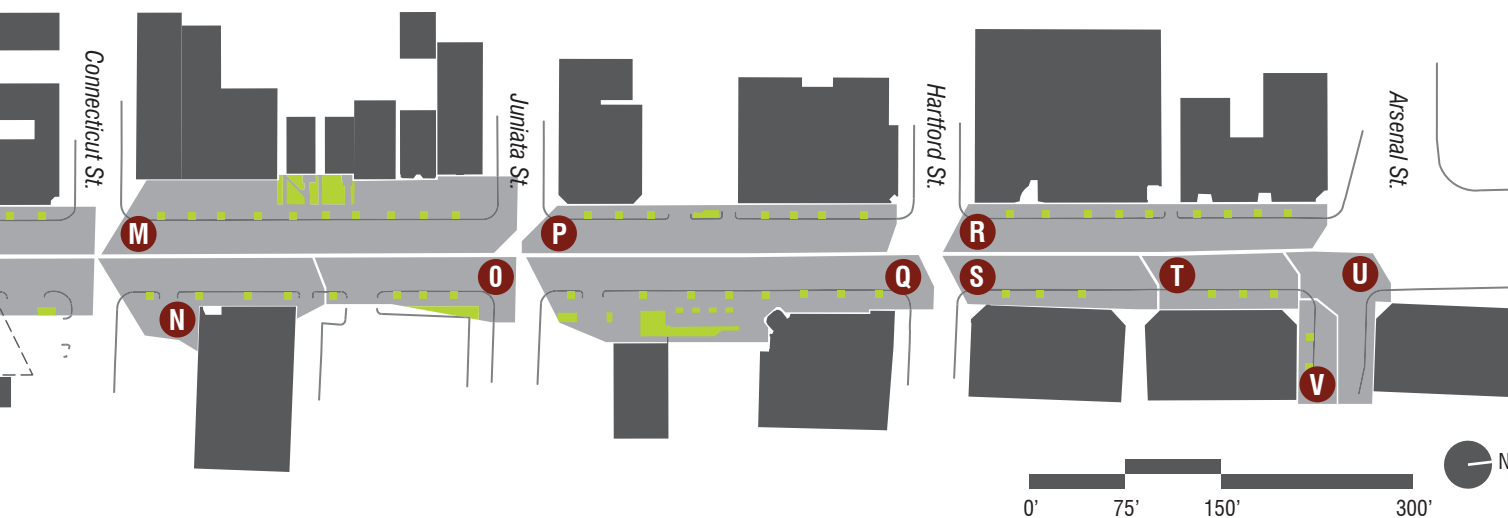


Figure 2-61: Bar graph delineating the percentages of impervious and pervious surfaces for each catchment area. (created by author)

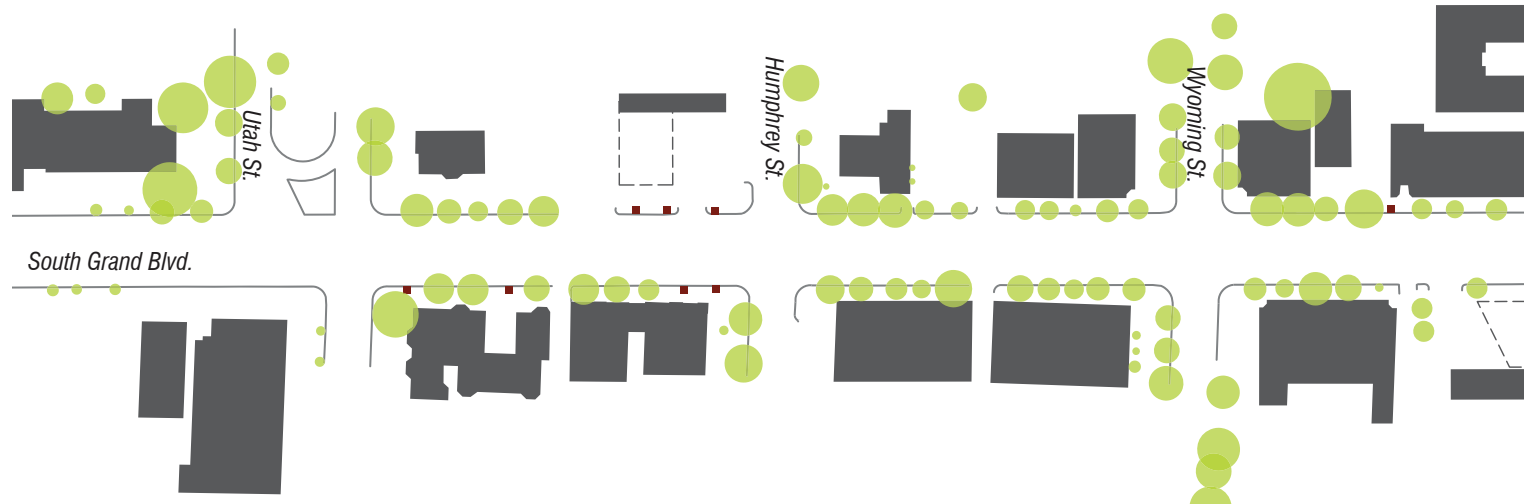


Figure 2-62: Street tree analysis map. (created by author)

Legend:

- Tree Grate with No Tree
- Tree Canopy
- Building Footprint
- Roadway Curb
- - - Overhead Canopy



Figure 2-63: Narrow sidewalk conditions along the east side of South Grand Blvd. from Humphrey St. to Utah St. (photographed by author)

street tree analysis

General Information

Urban street trees play a vital role in reducing the urban heat island effect and the volume of stormwater runoff. Additionally, they increase air quality, assist in the sequestration of carbon, and enhance the overall aesthetics of a place. Consequently, a great value exists in knowing when underperforming street trees should be removed and replaced with species that offer greater return for the municipality's ongoing economic investment.

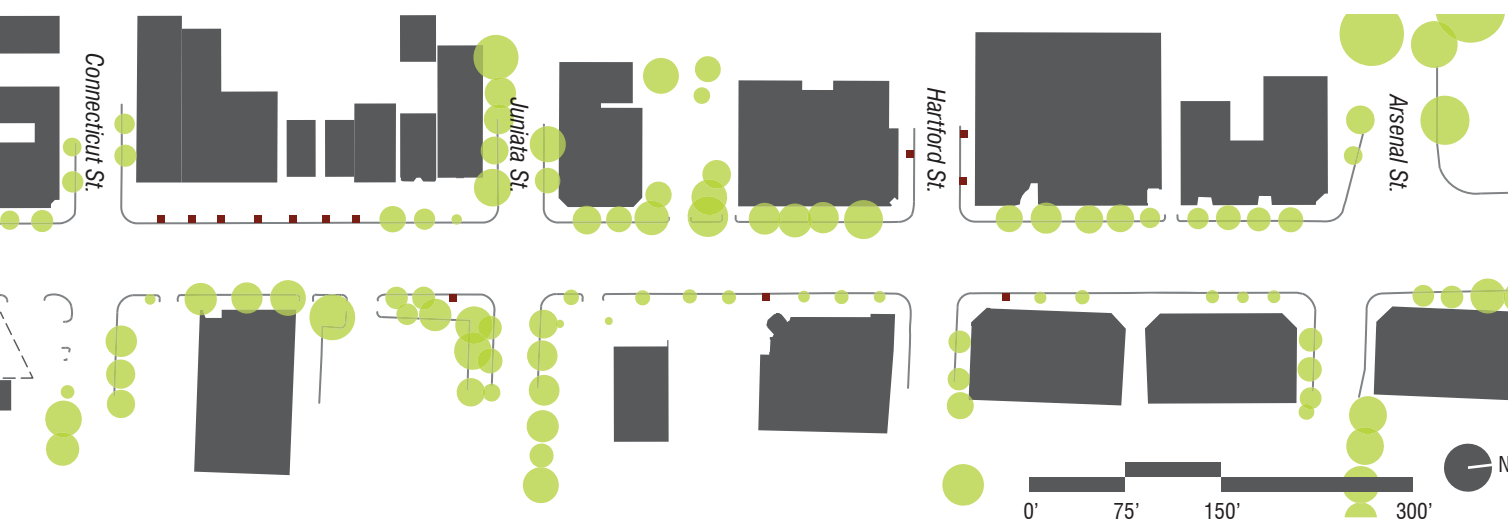
In March of 2009, the Davey Resource Group published its analysis of St. Louis' existing street tree population. Their analysis quantified the value of urban street trees in terms of net economic benefit. Figure 2-64 is a table extracted from their report summarizing the net annual benefit of each tree species per level of service. At South Grand, the Thornless Honeylocust (*Gleditsia triacanthos var. inermis*) exists as the prevalent street tree. At a total net annual worth of \$55.22 to the city, it is certainly not a horrible choice; however, a quick reference of the summary table reveals several species with much higher net annual values to the city. The top two choices include the Pin Oak (*Quercus palustris*) with a net value of \$111.10 per year and the Sycamore (*Platanus occidentalis*) with a net value of \$75.52 per year.

Opportunities

With the above information, a significant opportunity exists for replacing the existing Honeylocusts observed to be in poor condition with little room for future root growth and badly disfigured canopies. Furthermore, Figure 2-62 denotes the sizable number of empty tree pits and grates along the sidewalk.

Constraints

Figure 2-63 illustrates one constraint observed within this analysis. The narrow sidewalk space in front of the multi-story residential building located adjacent to the Utah Street intersection inhibits the notion of planting street trees.



Species	Energy	CO ₂	Air Quality	Stormwater	Aesthetic/Other	Total (\$) Standard Error
Green ash	5.47	1.10	2.25	17.46	29.37	55.65 (N/A)
Pin oak	10.86	3.16	4.19	43.29	49.59	111.10 (N/A)
Silver maple	7.77	1.56	3.21	32.81	28.99	74.33 (N/A)
Red maple	4.43	0.61	1.76	15.94	29.20	51.94 (N/A)
Sycamore	11.88	1.72	4.95	40.93	16.04	75.52 (N/A)
Sugar maple	4.17	0.68	1.58	15.95	31.93	54.32 (N/A)
Callery pear 'Bradford'	1.74	0.20	0.77	5.56	11.55	19.81 (N/A)
Thornless honeylocust	4.50	0.96	2.40	19.17	28.19	55.22 (N/A)
White ash	3.17	0.68	1.32	11.83	33.46	50.46 (N/A)
Sweetgum	9.26	1.65	3.82	30.86	28.64	74.23 (N/A)
Redbud	1.39	0.21	0.79	6.06	10.51	18.94 (N/A)
Littleleaf linden	3.29	0.45	1.41	11.37	15.78	32.31 (N/A)
American basswood	7.09	1.35	2.93	23.20	29.58	64.15 (N/A)
Norway maple	3.74	0.54	1.55	14.14	25.19	45.16 (N/A)
Apple	2.26	0.39	0.94	5.80	12.48	21.87 (N/A)
Ginkgo	5.14	1.03	2.12	16.42	28.46	53.17 (N/A)
Callery pear 'Aristocra	1.89	0.20	0.84	6.01	9.07	18.00 (N/A)
Other street trees	4.63	0.87	2.06	18.42	27.43	53.40 (N/A)

Figure 2-64: Net annual benefit of public trees by species (\$/tree). (Davey Resource Group)

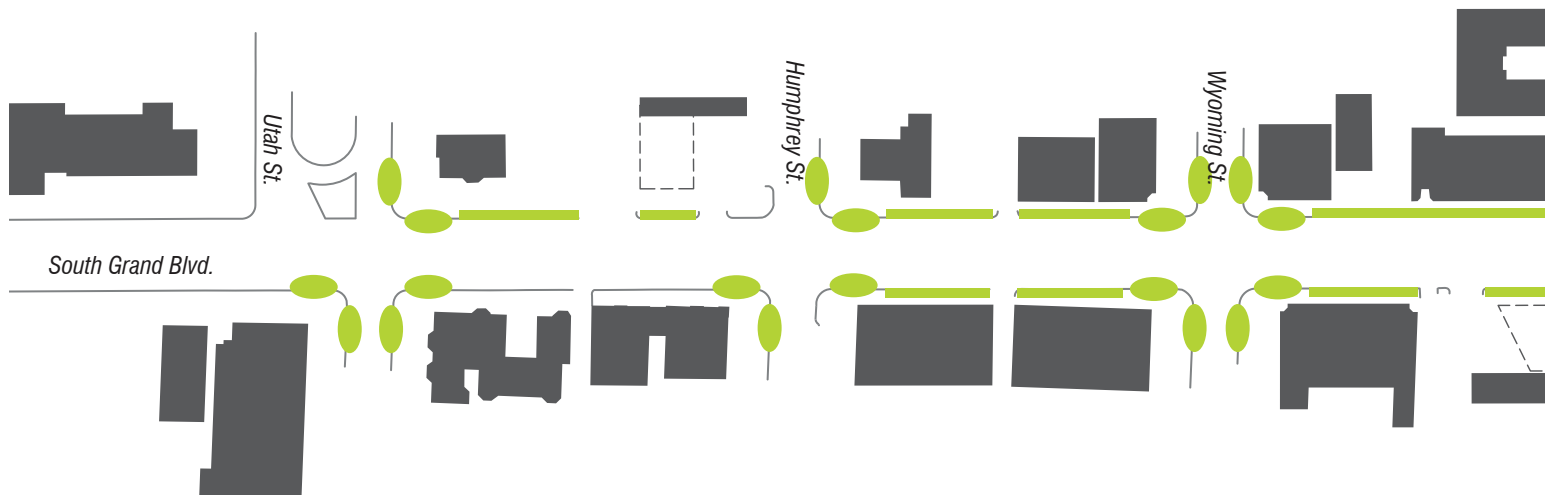


Figure 2-65: Eco-technology suitability map. (created by author)

Legend:

- Vegetated Wall System
- Linear Stormwater Planters
- Intersection Bulb-out Stormwater Planters
- Residential Rain Garden
- Building Footprint
- Roadway Curb
- - - - Overhead Canopy



Figure 2-66: Rain barrel attached to downspout.
(<http://www.rainbarrelsandmore.com/homeandgardensalesonline/50tc.jpg>)

eco-technology suitability analysis

General Information

Eco-technologies are defined as the practical applications of ecologically sensitive techniques, processes, activities, and/or structures into the existing urban fabric's grey infrastructure. They can range from "hard" mechanical systems to "soft" ecological systems in which living plants grow. In either case, the inclusion of plants is not a prerequisite for their classification as an eco-technology. Instead, their design must provide some level of ecosystem service.

Opportunities

Not all eco-technologies are appropriate for every project or location. In terms of South Grand, several eco-technologies are appropriate for the narrow right-of-way conditions. First, rain barrels could be located on all exposed downspout locations assisting in the capture and slow release of rooftop runoff. Second, the incorporation of a vegetated wall system upon the bland, south facing wall of Jay International Foods' building (see Figure 2-67) could reduce the annual energy costs of heating and cooling while also providing a much more aesthetically pleasing exterior facade. Third, rain gardens could be integrated into the front yards of the two residential houses located on the west side of South Grand Boulevard between the intersections of Juniata Street and Connecticut Street. Fourth, depending on the structural integrities of the adjacent buildings, green roofs with rooftop gardens could take advantage of wasted space. Fifth, linear stormwater infiltration planters could be integrated within the amenity zone of the sidewalk. Lastly, larger stormwater planters could be placed within intersection curb bulb-outs. These final two eco-technologies would have the greatest impact in raising the user orientation of the urban right-of-way.

Constraints

The inclusion of stormwater infiltration planters within the high clay content soil necessitates that soil amendments be made if the eco-technologies are to function properly.

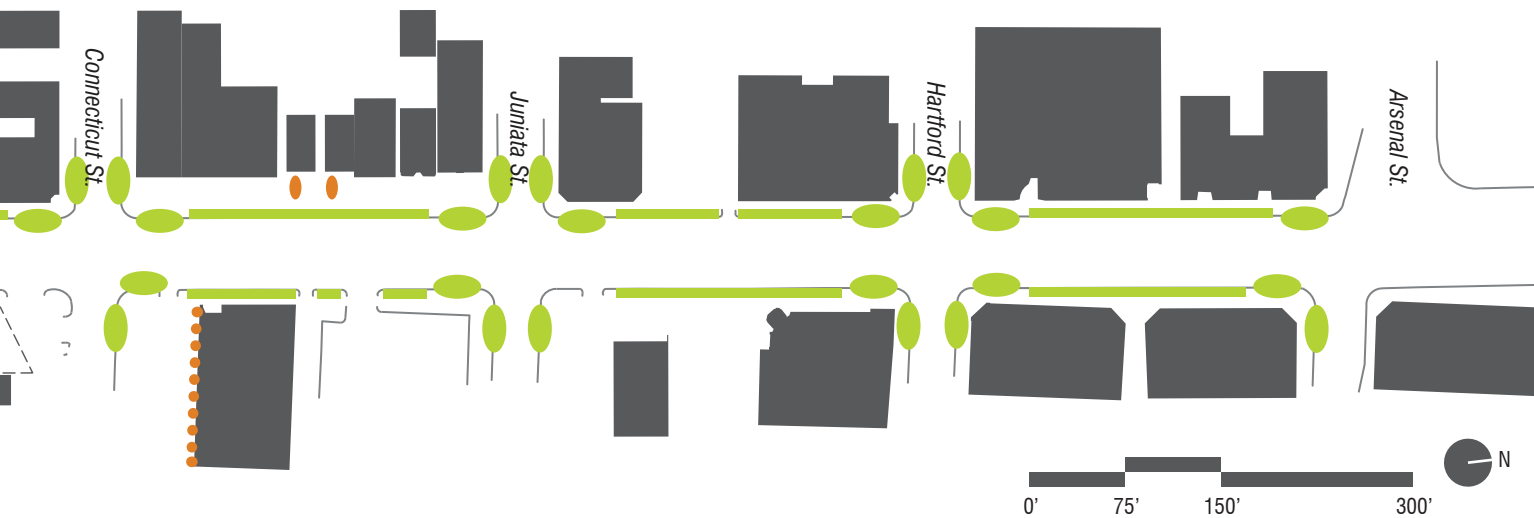


Figure 2-67: South facing wall of Jay International Food's building could be retrofitted with a vegetated wall system. (photographed by author)



Figure 2-69: Rain garden. (<http://www.daytonbioretention.com/wp-content/uploads/2010/05/Salem-and-Catalpa.jpg>)



Figure 2-68: Vegetated wall system. (<http://goodearthplants.com/public/TJSL%20Wall/TJSLLivingWall1.31.11049A.jpg>)



Figure 2-70: Green roof. (<http://c1.ecolocalizer.com/files/2010/04/CityHall.jpg>)

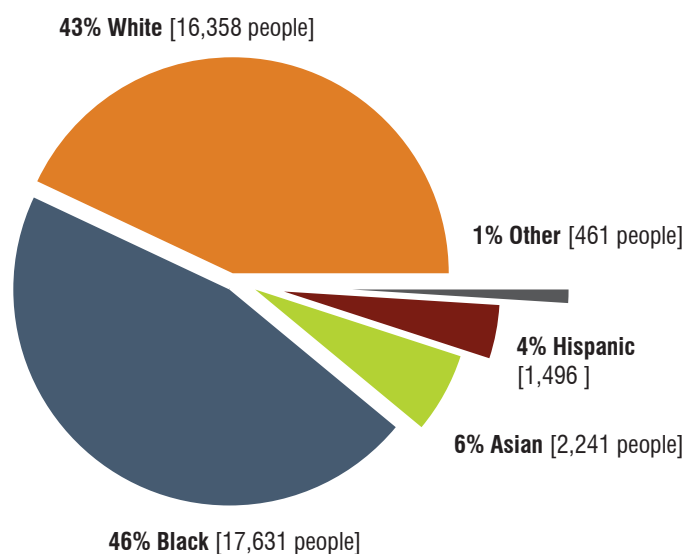


Figure 2-71: Pie graph of major ethnic populations within a 1 mile radius of the project site. (Census 2000 data; graphic created by author)

Genius Loci

user ethnicity analysis

General Information

At the genius loci level of the proposed framework, the development of a “community of users” requires the designer to identify and understand the predominant user groups living in the neighborhoods surrounding the site. Using Census 2000 population data, this analysis determines the ethnic population centers within a 1 mile radius for the four primary races: White, Black, Asian, and Hispanic. The initial determination of which census blocks should be included in the analysis came from whether or not the centroid of each census block fell within the 1 mile radius. Next, in order to accurately represent the data, each of the four ethnic group populations were divided by the area of the given census block. The result is a density of ethnicity for each census block. Figures 2-72 through 2-75 portray the final classification of the census blocks into five natural break classifications.

Opportunities

Surprisingly, one can observe three distinct population centers. Furthermore, South Grand seemingly acts as the point at which all three ethnic groups converge. White populations tend to congregate to the north and west of the site (see Figure 2-72). Black populations tend to congregate to the east of the site (see Figure 2-73). Asian populations form the strongest center to the direct east and south of the site (see Figure 2-74). The results of this analysis make a strong argument for the development of a “community of users” at South Grand, not contingent upon any one ethnic group but rather the collective whole of them all.

Constraints

In comparing the observed population centers to the inventoried land value data (see Appendix D), one finds another surprising fact. Though neighborhoods surrounding South Grand Boulevard seem to be of similar construction and level of upkeep, the land values to the west tend to be higher than the ones to the east.

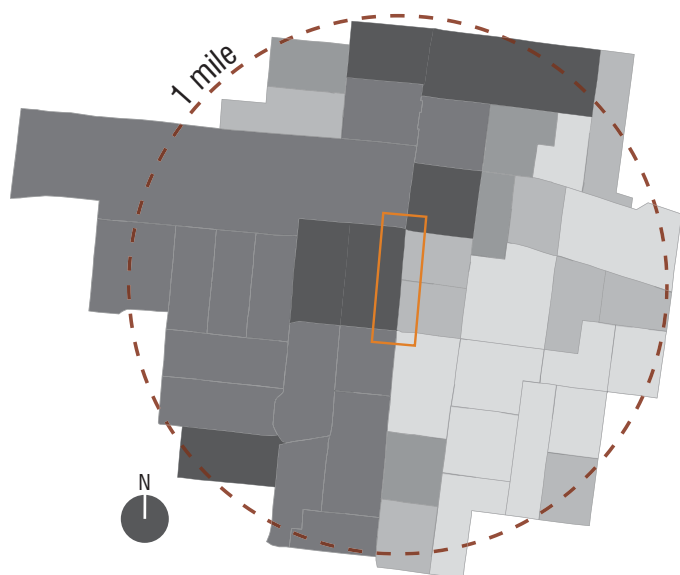


Figure 2-72: White population centers. (created by author)

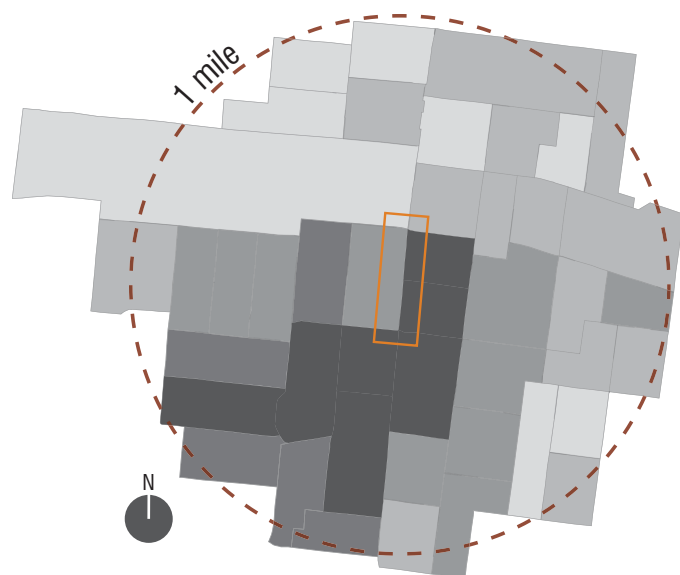


Figure 2-74: Asian population centers. (created by author)

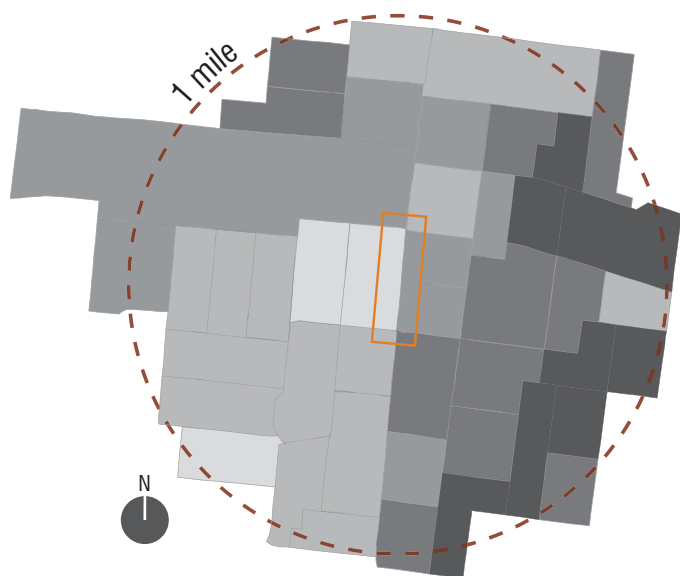


Figure 2-73: Black population centers. (created by author)

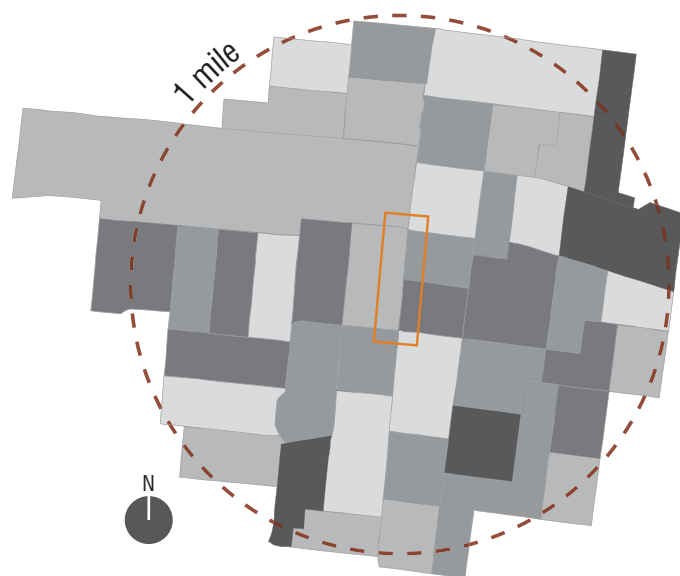


Figure 2-75: Hispanic population centers. (created by author)

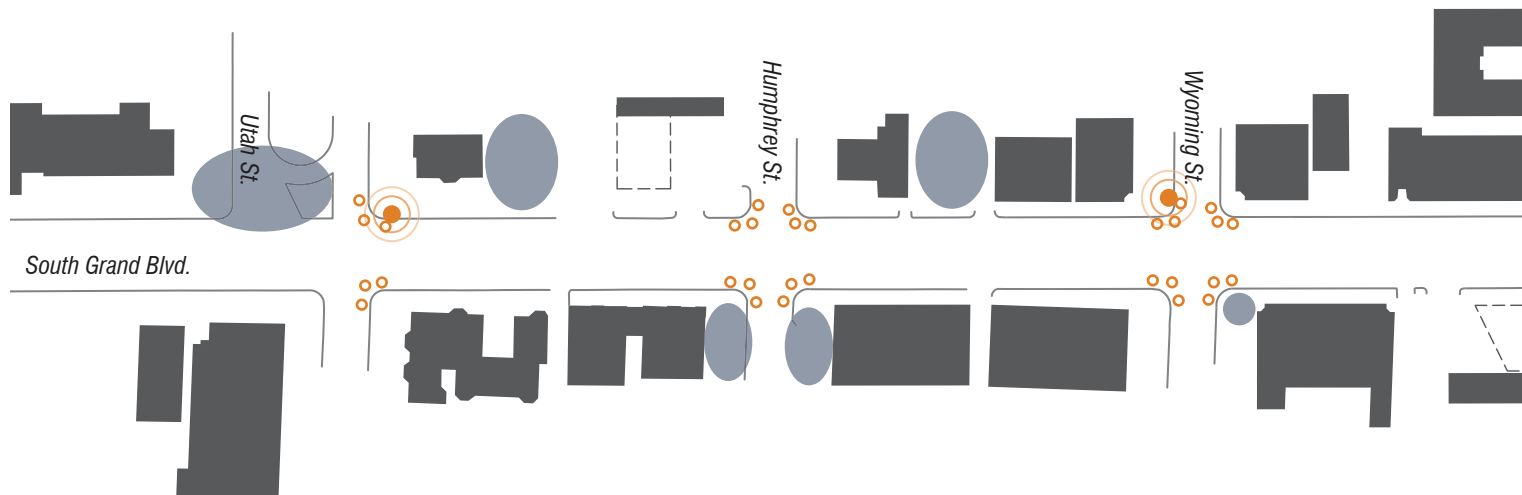


Figure 2-76: Public art analysis map. (created by author)

Legend:



Painted Concrete Barricades



Mosaic on Traffic Control Box



Potential Location of Publicly Commissioned Art



Building Footprint



Roadway Curb



Overhead Canopy



Figure 2-77: Mosaic veneer over traffic signal control box. (created by author)

public art analysis

General Information

In addition to South Grand's historical identity as an ethnically diverse district, multiple displays of public art reveal the creative nature embodied within the district. Figures 2-77 through 2-81 portray some examples how the district uniquely expresses itself. While walking the length of the six-block district one can readily observe artistic ground plane treatments within adjacent parcels, mosaic tabletops for outdoor dining, artistically designed building entries, mosaic traffic signal boxes, and most notably, painted concrete barriers at each intersection denoting the extent of the proposed curb bulb-outs.

Opportunities

A truly significant opportunity exists for incorporating public art into the new design proposal. Following the construction of the intersection curb bulb-outs proposed by Design Workshop, the painted concrete barriers will be removed. Instead of losing such an iconic component of the district, one which provides each intersection a unique identity, the design proposal should incorporate a reinterpretation of these features. Perhaps the concept could be to simply place bland, concrete objects along the edge of the sidewalk space for local users to once again paint as they see fit. In this scenario, the designer stages the spatial location of the objects, and the community decides which messages they wish to express.

The light blue ovals within Figure 2-76 represent potential locations for publically commissioned art installations. Some of these areas are highlighted due to a current underutilization of space while others offer potential locations for an educational pocket park.

Constraints

With many programmatic elements competing for space within the narrow sidewalk conditions, a designer must be selective about where public art is placed. The placement of public art should not interfere with the function and safety program of the site.

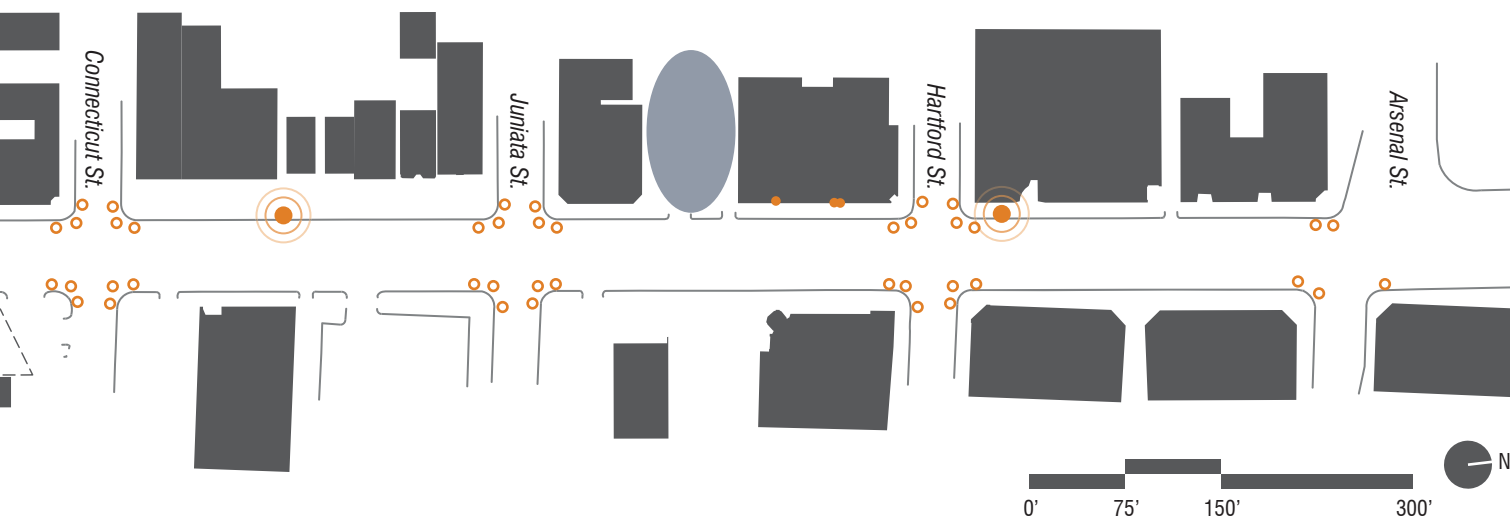


Figure 2-78: Painted concrete barricades at Hartford St. intersection.
(photographed by Janice Ziegler)



Figure 2-80: Painted concrete barricade at Wyoming St. intersection.
(photographed by author)



Figure 2-79: Painted concrete barricade at Juniata St. intersection.
(photographed by author)



Figure 2-81: Painted concrete barricades at Humphrey St. intersection.
(photographed by author)

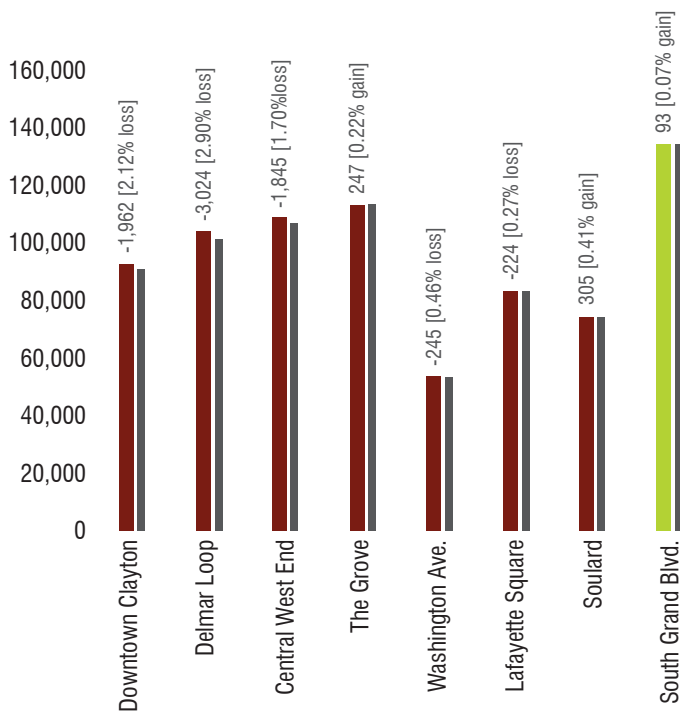


Figure 2-82: Bar graph illustrating the total populations (2000 compared to 2007) of people living within a 2.5 mile radius of each competing district. (Census 2000 data; graphic created by author)

competing districts analysis

General Information

Though the district is only six-blocks in length, the analysis of South Grand should not be constrained to the site and neighborhood scales. Rather, the long-term economic viability of the district depends on a regional analysis of three key components: location, services offered, and identity within the regional marketplace. What will entice people to visit South Grand over other competing business districts in the area?

Figure 2-83 references South Grand's location in comparison to seven other competing business districts. This analysis specifically addresses which of these districts has the greatest population base within a 2.5 mile radius (see Figure 2-82). The specific process for analyzing the population data is consistent with the process described in the user ethnicity analysis, apart from using different inputs (see page 85). Interestingly enough, South Grand has the greatest number of people living within 2.5 miles of the district. Coupled with the fact that Interstate 44 is only 1 mile to the north, this analysis reveals the quantified importance and potential of South Grand to increase its regional identity, thus capturing greater economic returns.

Opportunities

Through the lens of ecology, South Grand could be re-envisioned as a place known for its high level of innovation and forward thinking. Collectively, the integration of ecological processes into the urban environment and the development of a strong community of committed users will communicate to the regional marketplace that "we are progressive," "we are smart," and "we are sophisticated" (Echols and Pennypacker 2008).

Constraints

Of the three components needed for the creation of a long-term economically viable district, South Grand currently lacks the ability to provide users a variety of services other than unique restaurants.



Figure 2-83: District competition map. (created by author)

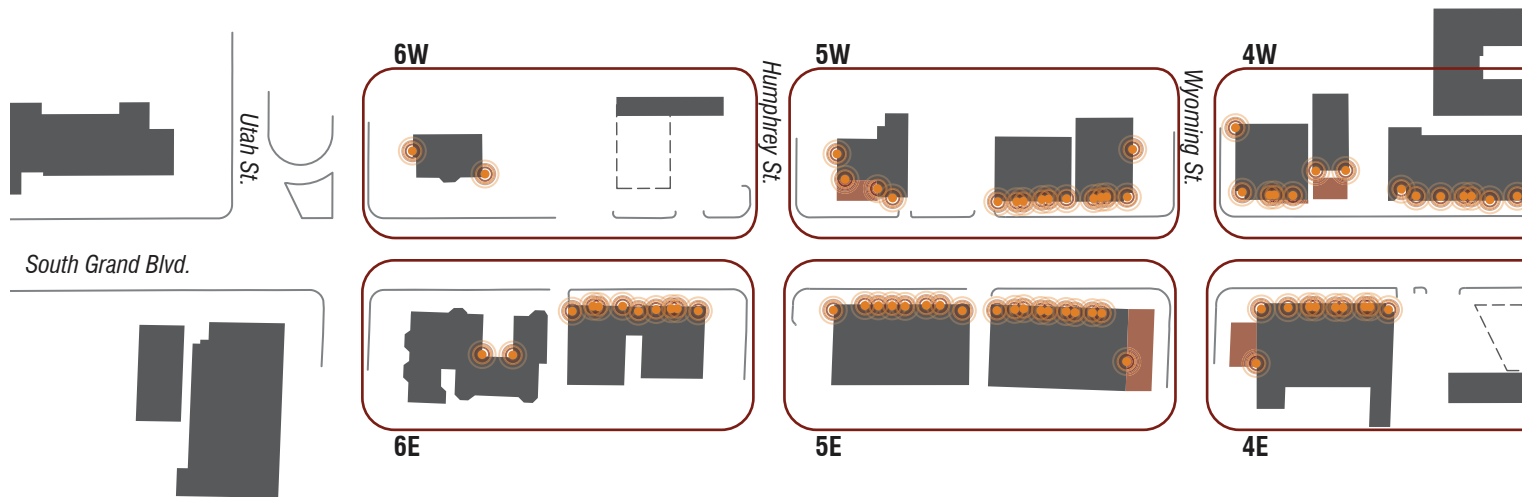


Figure 2-84: Building entry and outdoor dining analysis map. (created by author)

Legend:






-  Building Entrance
-  Existing Outdoor Dining Areas
-  Building Footprint
-  Roadway Curb
-  Overhead Canopy



Figure 2-85: Artistic building entries. (photographed by Janice Ziegler)

building entry + outdoor dining analysis

General Information

Following the introduction of natural processes at the ecology level of the proposed framework, the genius loci level requires a higher degree of user-specific site design for the eco-technologies. As such, this analysis inventories the number of building entries and areas of outdoor dining for each block. The location of building entries primarily came from the site survey provided by Design Workshop; however, this information was verified through on-site observations. The delineation of outdoor dining areas was based solely upon on-site observations of site furniture. The results of this analysis can be seen in Figures 2-86 and 2-87. Lower numbers of building entries tended to be associated with either a residential land use or large amounts of surface parking.

Opportunities

The principal opportunity consists of the ability to alter rigorous applications of ecology along the entire street frontage. While a treatment train of stormwater infiltration planters is good for reducing stormwater runoff and increasing water quality, it is not always the most appropriate option if other program activities decline. For instance, the placement of stormwater planters along South Grand's sidewalks should change for each block as space is reserved for adjacency dependent activities such as outdoor dining.

Constraints

In striving to incorporate natural processes into the narrow urban right-of-way, the designer must always be attentive to the appropriateness of his/her design. If the eco-technologies interfere with the users' enjoyment of the place, the users will not support the ongoing investment needed to maintain the ecology and may even demand its removal.

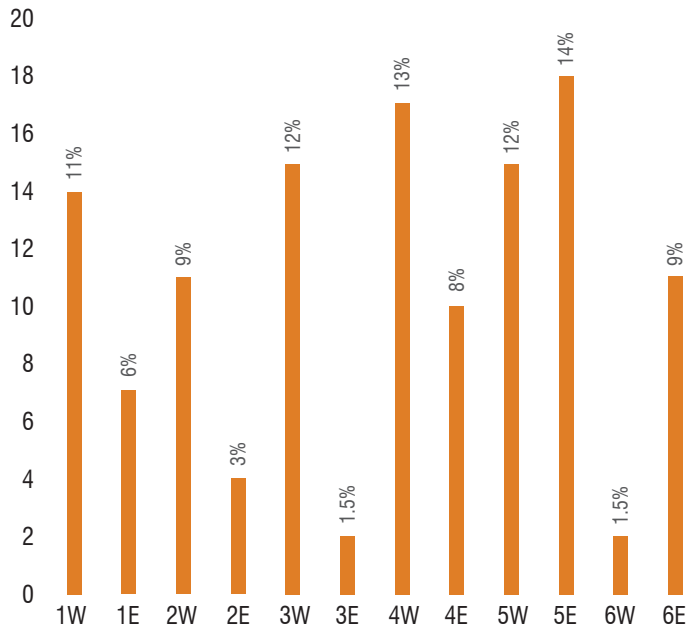
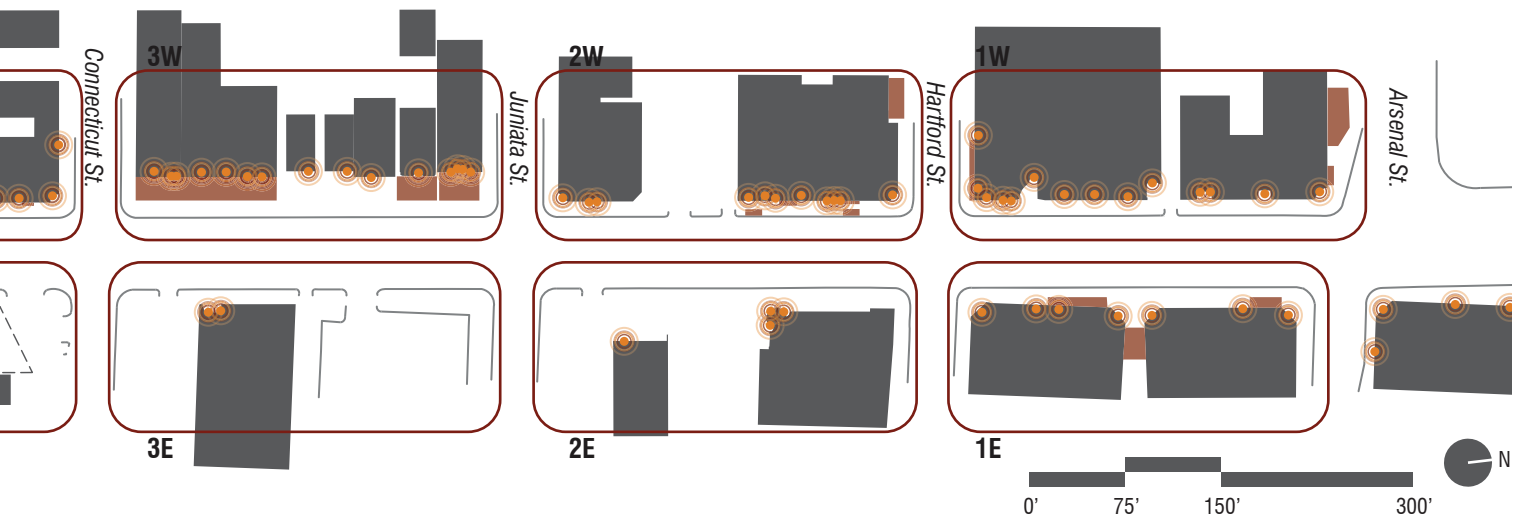


Figure 2-86: Bar graph of building entries comparing each side of the block to one another. (created by author)

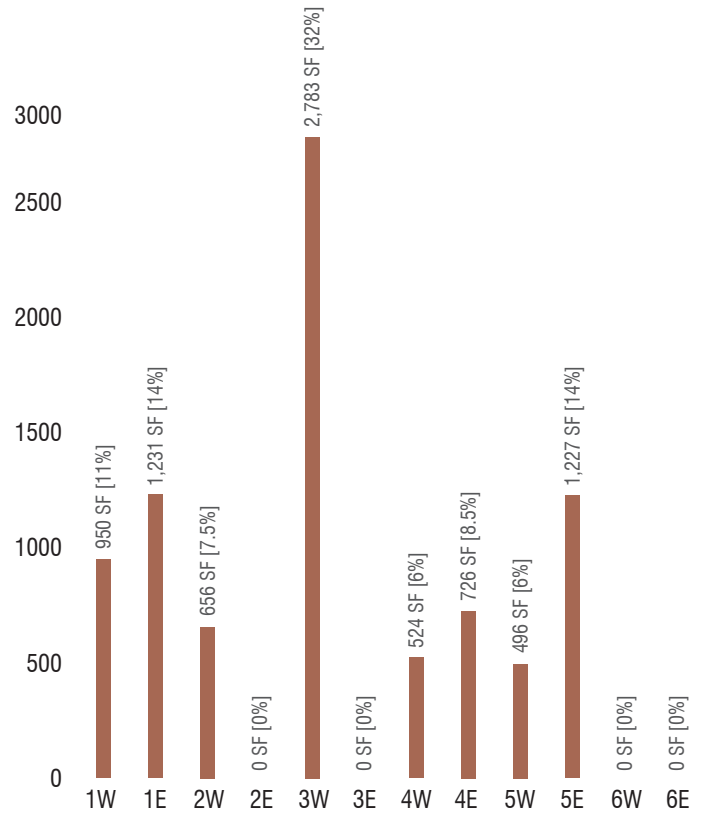
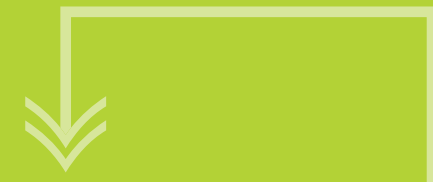


Figure 2-87: Bar graph of outdoor dining areas comparing each side of the block to one another. (created by author)

APPLY

3

EVALUATE



→ APPLY METRIC
TO DESIGN

↓
COST-BENEFIT
ANALYSIS

↓
IDENTIFY
UNANSWERED
QUESTIONS



SYNTHESIZE



ce discovered
nowledge applied

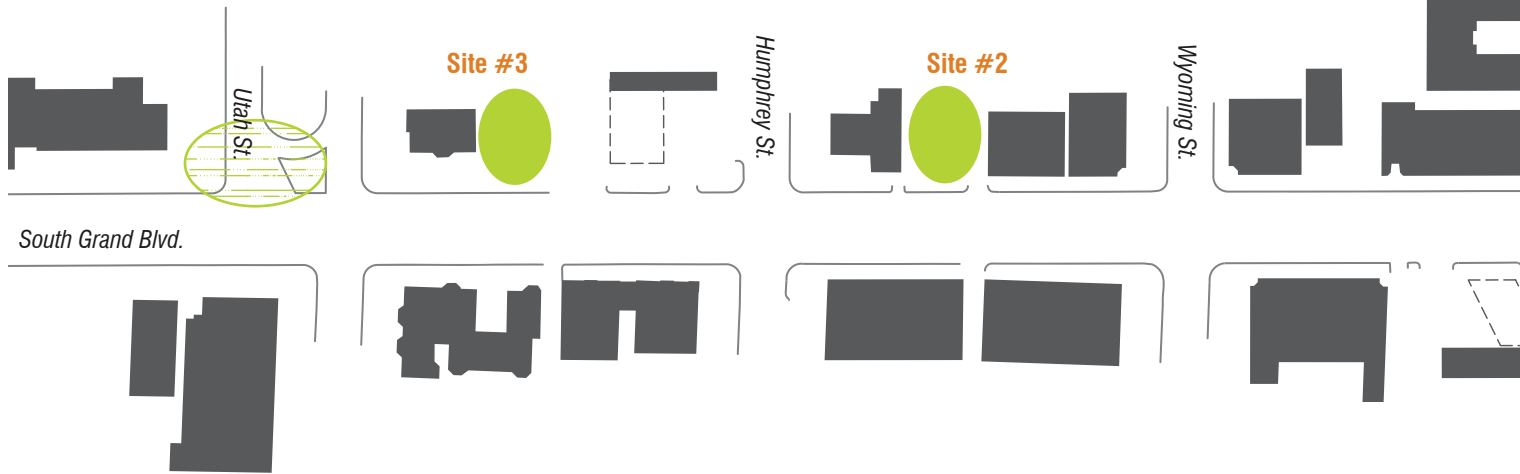


Figure 3-1: Context for learning suitability analysis map. (created by author)



Figure 3-2: View of Site #2 - selected for the location of an educational pocket park. (photographed by author)

Meaning

context for learning suitability analysis

General Information

Figure 3-1 outlines six potential sites for the location of an educational pocket park. Three sites were quickly ruled out due to unrealistic losses in vehicular surface parking and poor spatial definition from adjacent structures. Findings from the previous analyses were assessed as pros and cons for each of the three remaining site choices. For this reason, the context for learning suitability analysis is considered to be a part of the synthesize stage, not the investigate stage. Site #2 was selected as the preferable location of the pocket park. The following text records the positive and negative traits of each site.

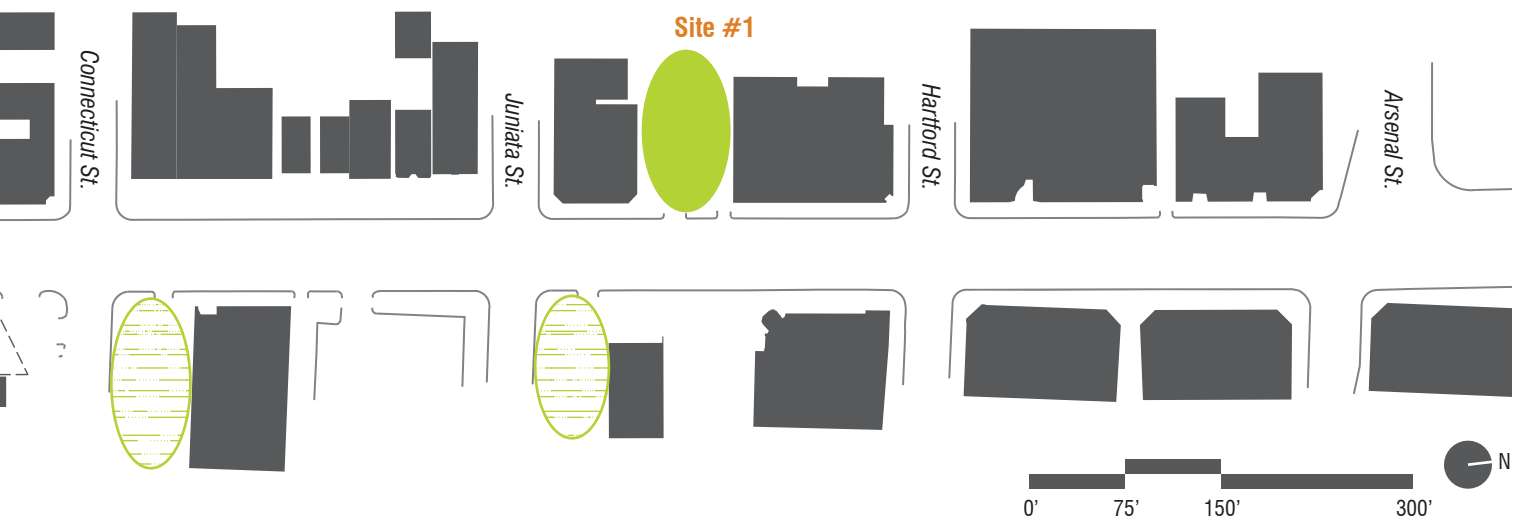
Site #1: located between Thai Cuisine and Mangio Italiano restaurants on the west side of South Grand Boulevard between Hartford Street and Juniata Street

Pros

- parcel already owned by the city of St. Louis
- potential rooftop catchment area: 18,767 SF
- existing surface: impervious
- good spatial definition provided by adjacent structures
- low land value
- closure of service alley provides more space for park with fewer conflicts
- close proximity to Tower Grove Park

Cons

- site area: 6,823 SF (too big – target of 3,000 SF)
- existing topography drains to a low point within the site, not the street
- loss of 16 vehicular parking stalls (utilization rates of 63% at mid-day, 100% during evening, and 88% on Friday night)
- intersection safety: 13 and 12 annual traffic accidents at Hartford St. and Juniata St. respectively



- only 4 building entries have lines of sight into the property from across South Grand Boulevard

Site #2: located between Café Mochi and TRX Tattoos on the west side of South Grand Boulevard between Wyoming Street and Humphrey Street

Pros

- parcel already owned by the city of St. Louis
- site area: 3,719 SF (within acceptable range – target of 3,000 SF)
- existing surface: impervious
- good spatial definition provided by adjacent structures
- 18 building entries have lines of sight into the property from across South Grand Boulevard
- intersection safety: 9 and 10 annual traffic accidents at Wyoming St. and Humphrey St. respectively
- existing topography drains to street
- aesthetically pleasing facade design (could offer underlying geometry for the design of the park)
- closure of service alley provides more space for the park with fewer vehicular conflicts on South Grand Boulevard
- low land value

Cons

- loss of 10 vehicular parking stalls (utilization rates of 100% at midday, 30% during evening, and 100% on Friday night)
- potential rooftop catchment area: 5,571 SF
- distance from Tower Grove Park

Site #3: located between a residence and the Phillips 66 gas station on the west side of South Grand Boulevard between Utah Street and Humphrey Street

Pros

- existing topography has potential to drain to street with a small amount of grading
- no vehicular parking stalls lost

Cons

- privately owned parcel that would have to be purchased by the city
- site area: 1,846 SF (too small – target of 3,000 SF)
- existing surface: pervious
- poor spatial definition provided by adjacent structures
- potential rooftop catchment area: 1,846 SF
- intersection safety: 10 and 11 annual traffic accidents at Humphrey St. and Utah St. respectively
- only 11 building entries have lines of sight into the property from across South Grand Boulevard
- not able to close adjacent service alley
- medium land value
- located far away from the commercial activity hub of the district
- distance from Tower Grove Park

Design Workshop's Ideas

extracted components

Design Workshop completed a thorough analysis and strong design proposal for the function and safety levels of the proposed framework. This report is meant to build upon the strengths of their efforts illustrating the advantages of applying the proposed framework to more urban right-of-way projects in the future. As a result, three significant design elements have been extracted from their master plan to serve as a point of departure for the design proposal found in the next chapter.

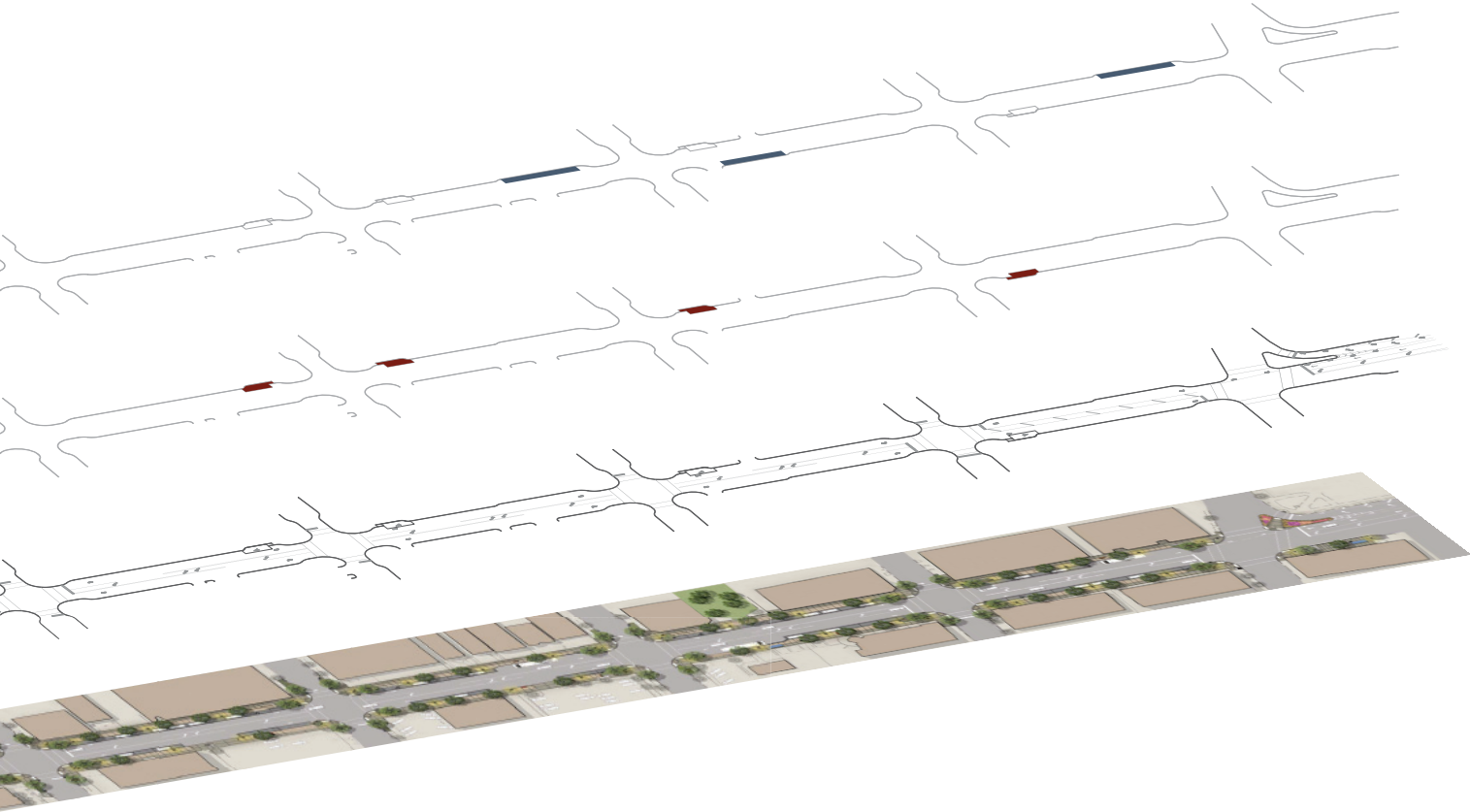
First and foremost, the vehicular lane configuration and associated curb alignments were extracted based upon their proven success of efficiency and community buy-in during a 30-day pilot test begun on September 9, 2009. Prior to any construction, Design Workshop worked with the city of St. Louis to restripe the travel lanes, adjust the timing of traffic signals, and place concrete barricades in the positions where curb bulb-outs were proposed. Following the pilot test, the community was surveyed for their input on the effectiveness of the design. Results included overwhelming support as “66 percent of the participants felt it was either a success or a great success.” Furthermore, one month after the completion of the pilot test, “73 percent of participants felt the pilot test should continue until permanent construction the following year” (Workshop 2010, 67). With high percentages of community acceptance, the 3-lane concept proposed by Design Workshop should be embraced, not reconsidered.

Second, extra-wide parking stalls are provided for those with disabilities at strategic locations throughout the district. Third, the location of bus stops remains consistent with Design Workshop's proposal. With the safety level goal of “promoting equality of experience for all users,” the inclusion of these two programmatic elements is vital to the urban right-of-way obtaining higher levels of user orientation.

Again, the objective in using these three elements as a starting point for the next chapter resides around the idea of furthering the work of Design Workshop, not recreating it.



Figure 3-3: Layered synthesis diagram illustrating which design elements were extracted from Design Workshop's master plan. (created by author)



Program

coded to project goals

Programmatic elements were derived from using the project design goals to break down the components under each level of the proposed framework (see Figure 2-29). Before entering the design application and evaluation sections of this report, it is important to call attention to the hierarchy of programmatic elements outlined for South Grand. Figure 3-4 codes each program element to the specific project goal that it most closely pertains to. The underlying principles of the Hierarchy of User-oriented Streets framework are applicable to the design and placement of each program element. For instance, if the placement of a bench intended to promote user interaction with an eco-technology (meaning level element), obstructs pedestrian circulation (safety level element), the level of user orientation will subside as annoyed users seek to remove the unnecessary hindrance. For this reason, the design proposal must respect the hierarchy of programmatic elements if South Grand is to be successful toward long-term resiliency.

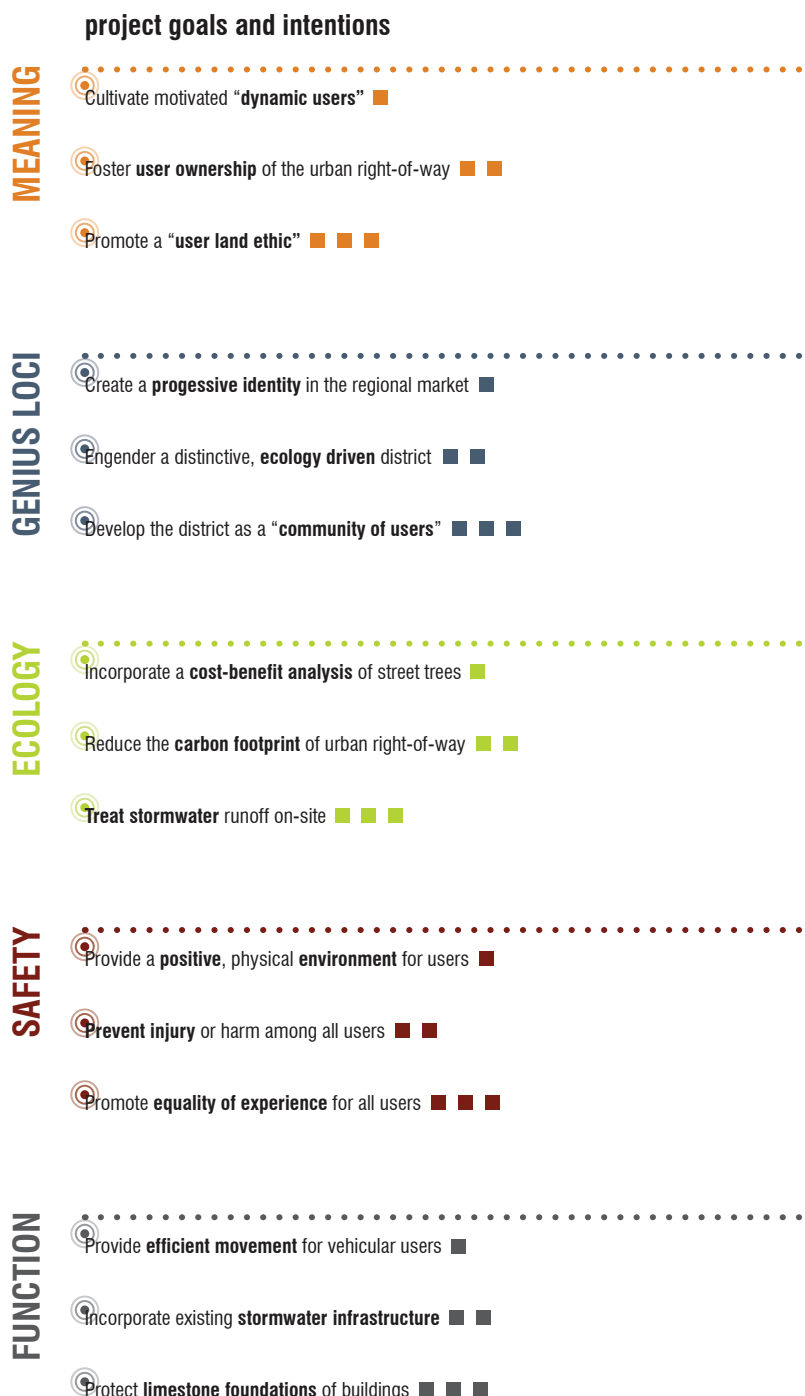
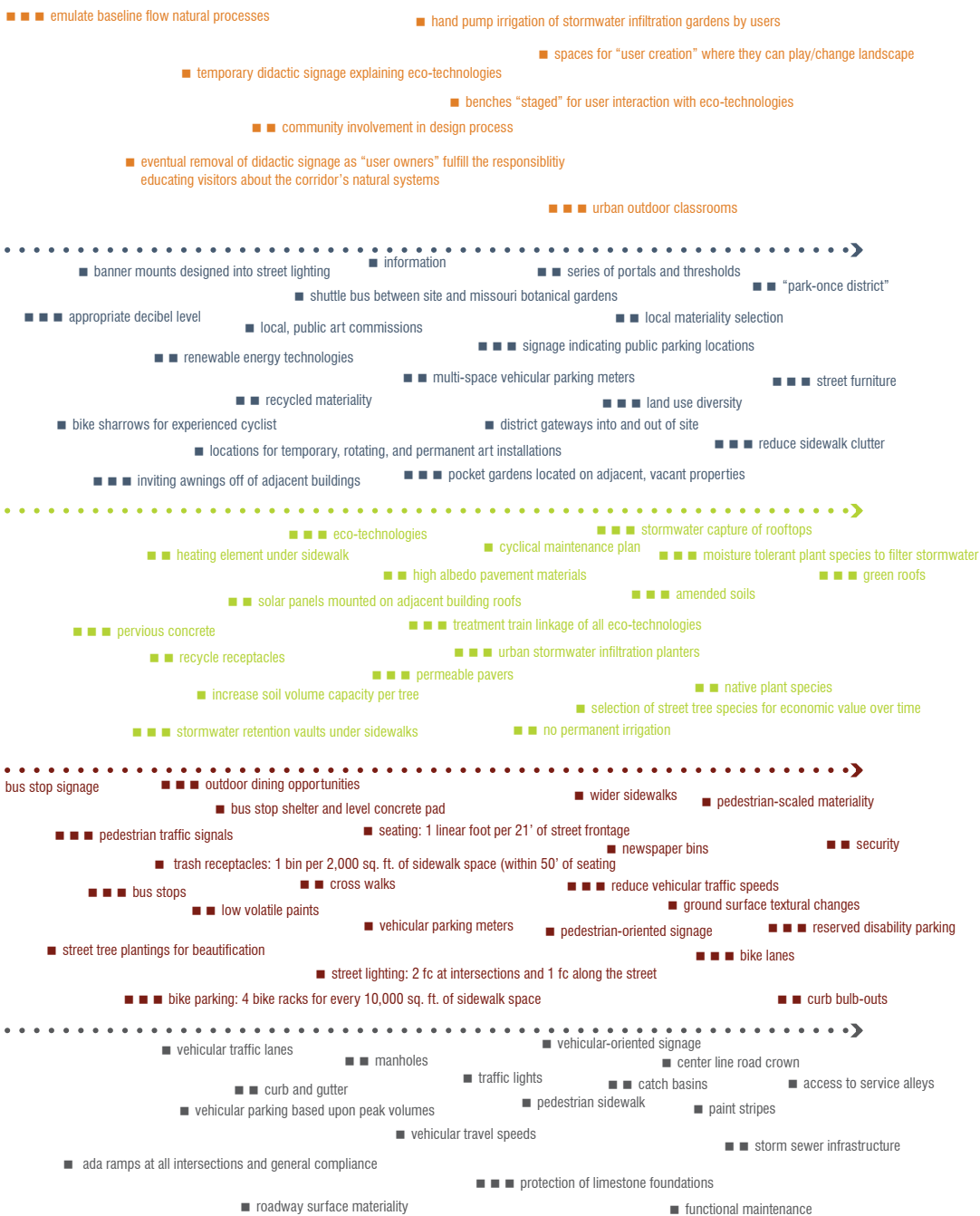


Figure 3-4: Hierarchy of programmatic elements coded to project goals. (created by author)

coded program elements



4

EVALUATE



→ APPLY METRIC

DESIGN

→ BENEFIT

ANALYSIS



IDENTIFY

UNANSWERED

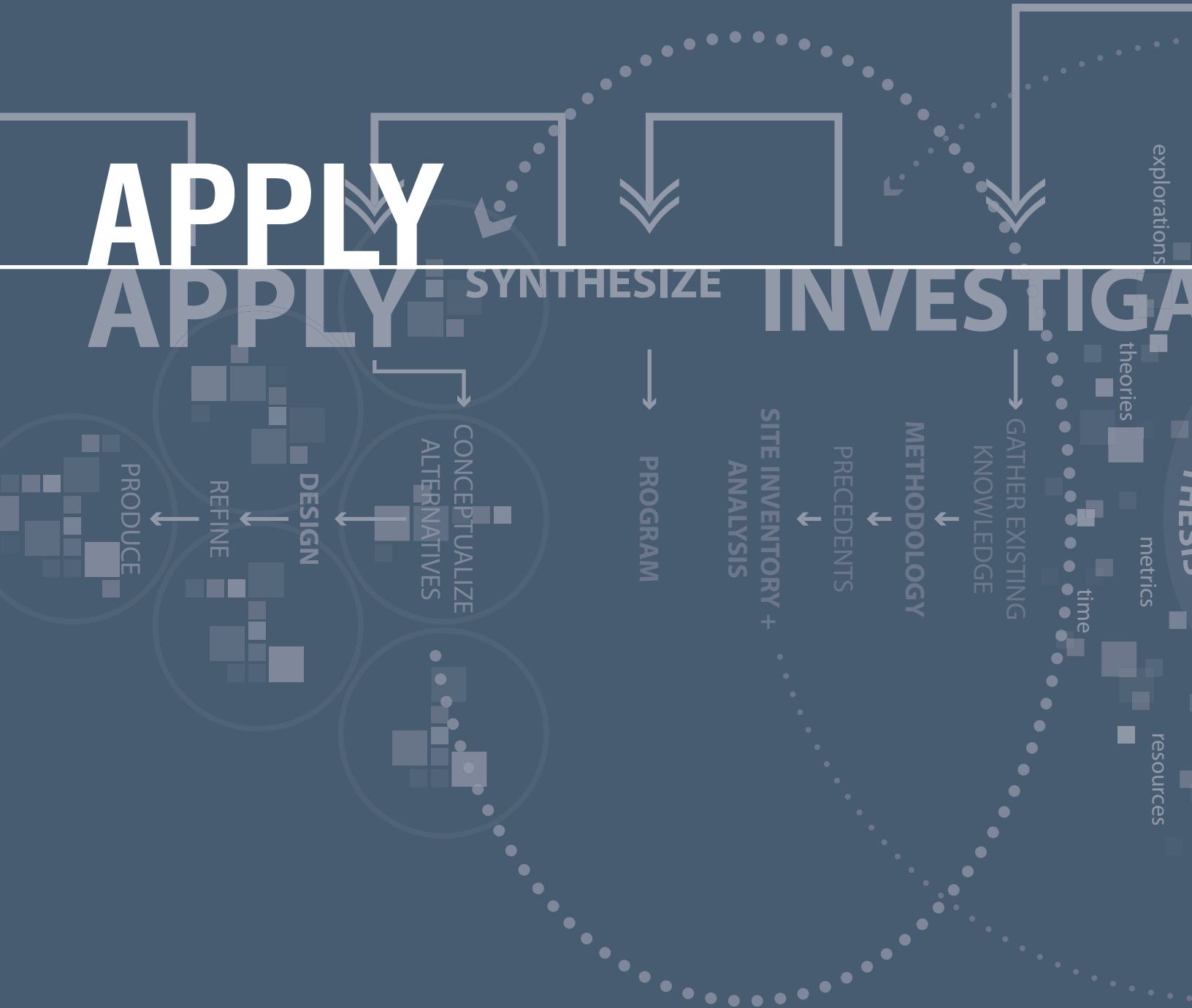
QUESTIONS



APPLY

APPLY SYNTHESIZE

INVESTIGATE



evidence discovered
knowledge applied

Design

Predominantly visual in nature, the content within the apply section of this report re-envision the design of South Grand through the lens of the proposed Hierarchy of User-oriented Streets framework. The abundance of information gleaned from the utilization of this framework throughout four precedent studies and an in-depth site inventory and analysis establishes a strong foundation for transforming the current “complete streets” proposal into a “resilient streets” proposal. In effect, this design proposal presents ideas that have the potential through time to increase the ecological, economic, and social productivity of the urban right-of-way to its greatest potential. If constructed to this high level of user orientation, South Grand Boulevard could become the exemplar of how we should design, construct, and maintain the next generation of our cities’ infrastructure.

The following pages present highly visual imagery to communicate the “realistic feel” of the design. In order to present the proposal in the conventional “big picture to increasing amounts of detail” method, the text explanations of the design concepts have been placed within the subsequent evaluation section. Using a coding method similar to that utilized in the precedent studies, Appendix A (see page 139) breaks down the design graphics into the five levels of the proposed Hierarchy of User-oriented Streets framework. In order to gain a comprehensive understanding of the design concepts proposed for South Grand, one must cross reference between the realistic illustrations within this section, the subsequent evaluation text (see page 129), and the coded breakdown of the imagery in the first appendix. In doing this, the strong connections between the theoretical ideas of the framework and the actual design concepts will be made clear.



Figure 4-1: Overall site master plan. (created by author)



Figure 4-2: Proposed master plan for southern portion of South Grand. (created by author)

Site Key:

- A. Small greenspace provided by the reconfiguration of the Utah St. intersection
- B. Educational pocket park
- C. Tower Grove Park
- D. Raised intersection
- E. Bus stop location
- F. Accessible vehicular parking space
- G. Removal of service access to alley
- H. Outdoor dining
- I. Sycamore trees located at each intersection
- J. Pin Oak trees placed in each linear stormwater planter
- K. Bike sharrow





Figure 4-3: Proposed master plan for northern portion of South Grand. (created by author)

Site Key:

- A. Small greenspace provided by the reconfiguration of the Utah St. intersection
- B. Educational pocket park
- C. Tower Grove Park
- D. Raised intersection
- E. Bus stop location
- F. Accessible vehicular parking space
- G. Removal of service access to alley
- H. Outdoor dining
- I. Sycamore trees located at each intersection
- J. Pin Oak trees placed in each linear stormwater planter
- K. Bike sharrow



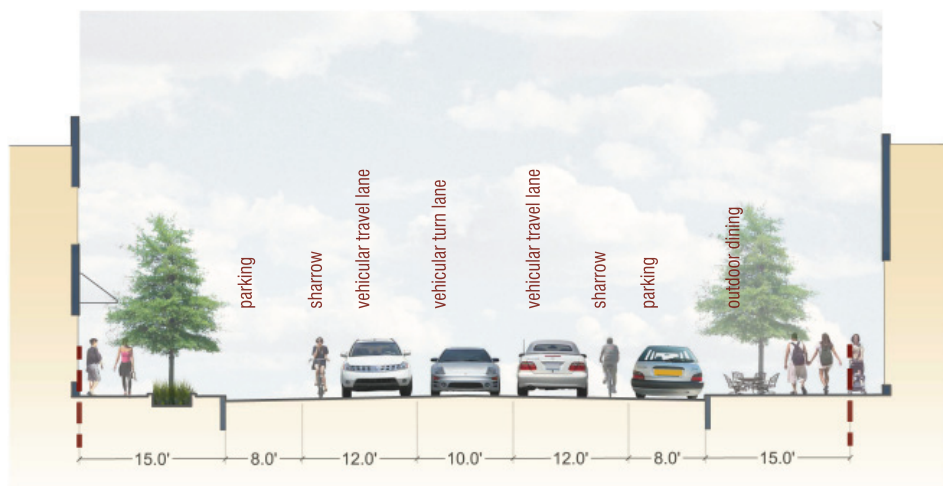


Figure 4-4: Section A-A illustrating variances in ecology treatment. (created by author)

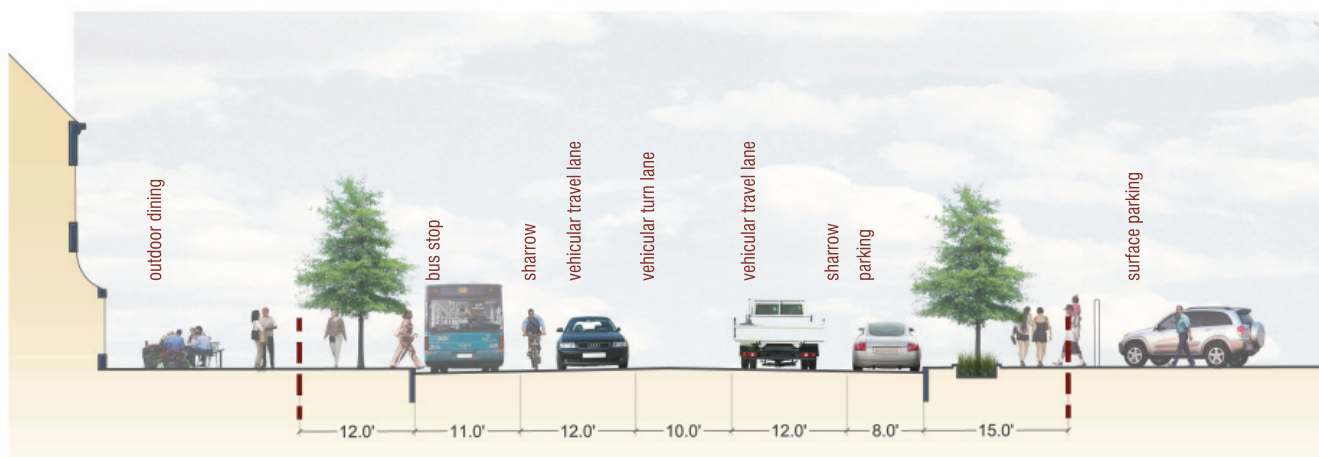
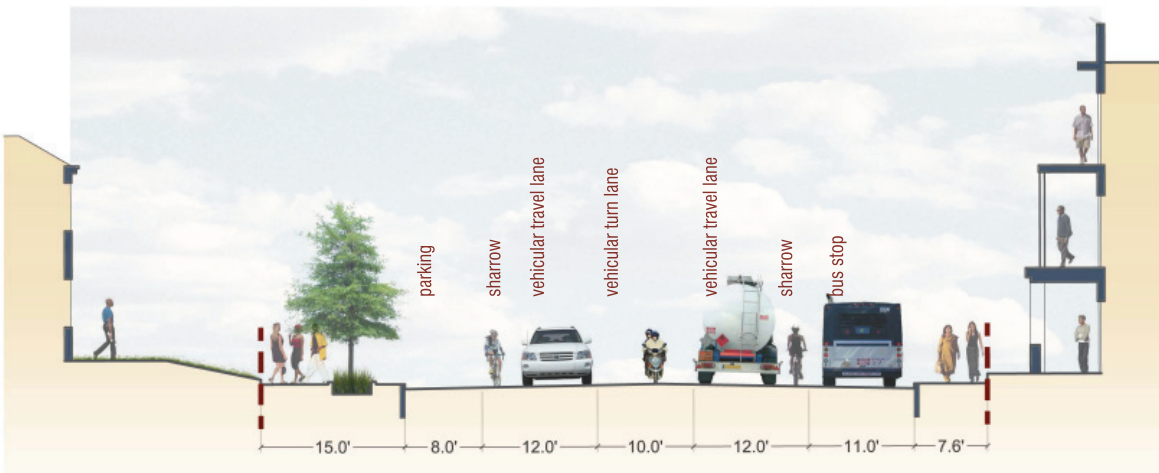
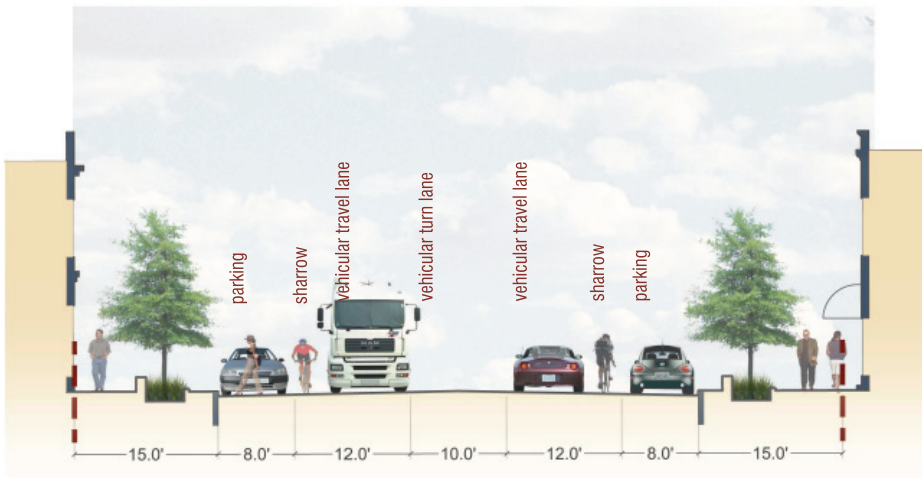


Figure 4-5: Section B-B illustrating variances in ecology treatment. (created by author)



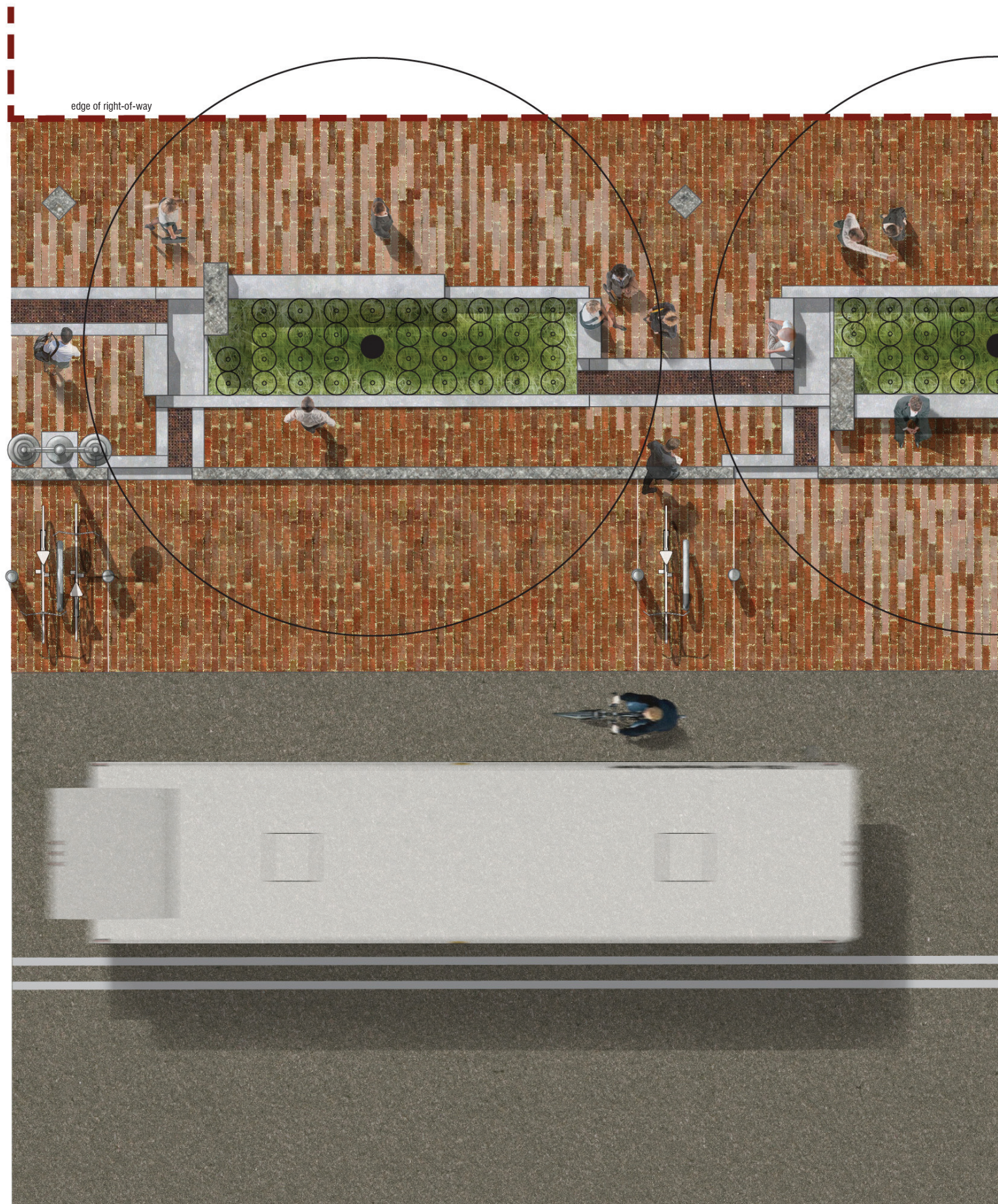
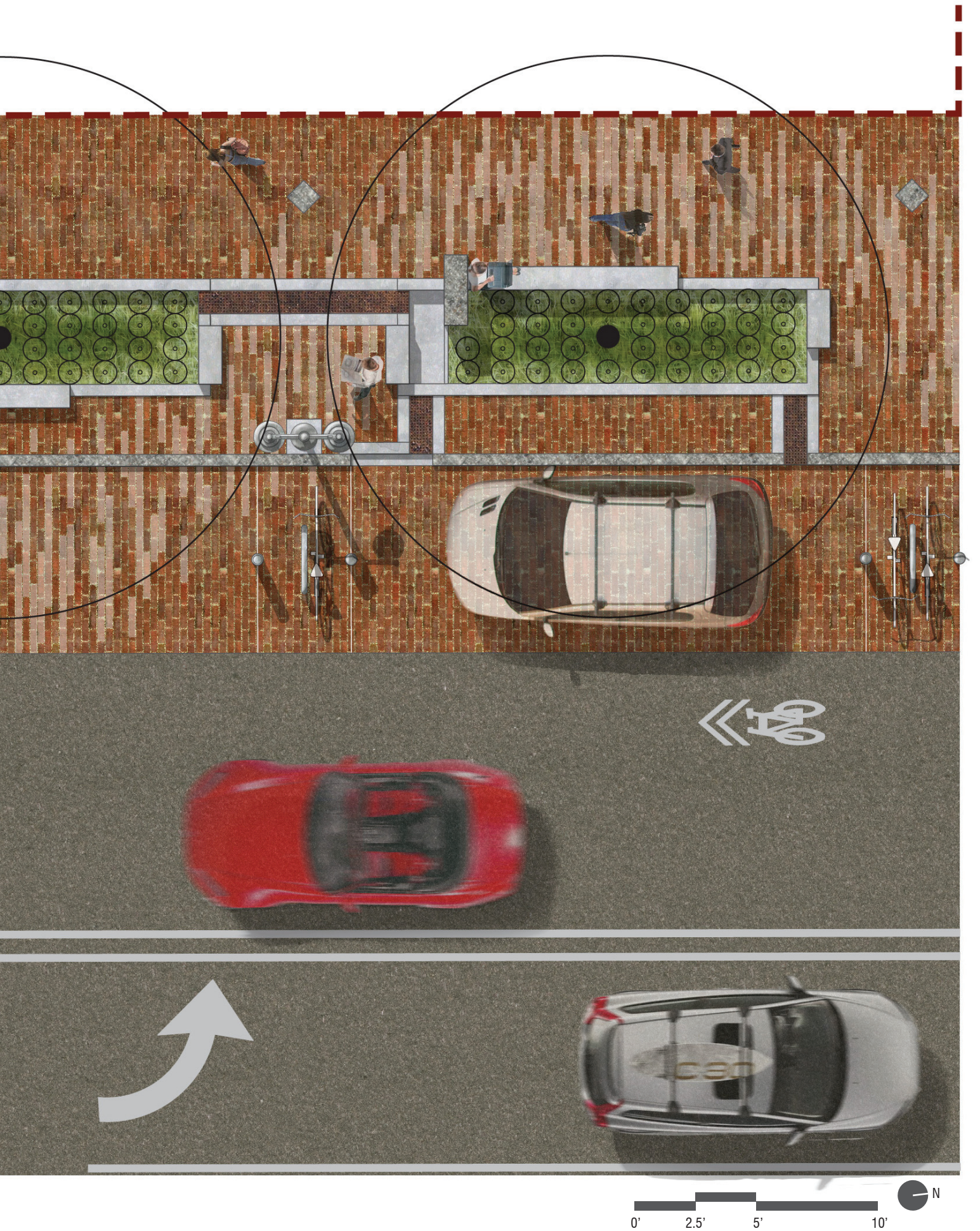


Figure 4-8: Detail plan of stormwater infiltration planter module. (created by author)



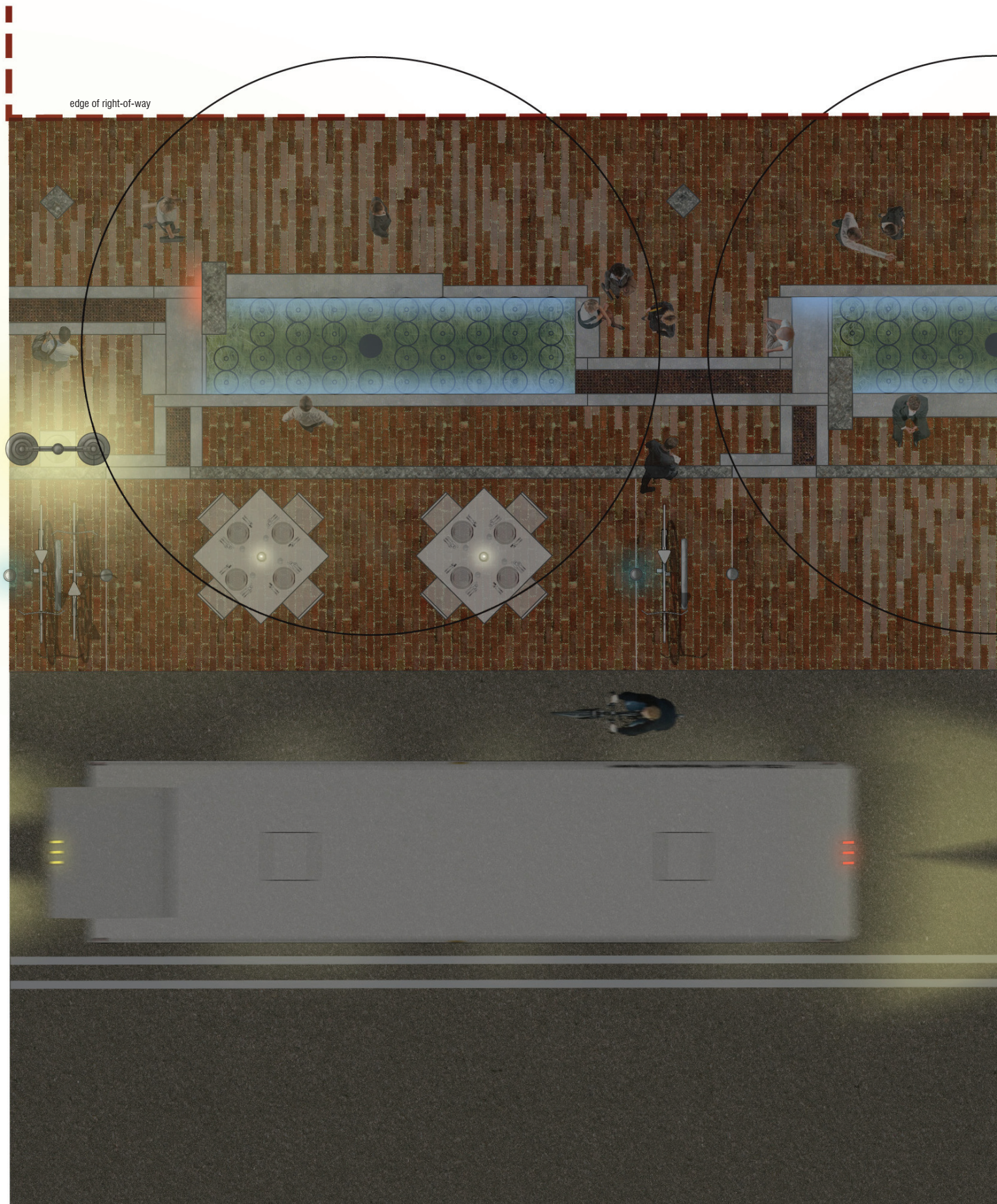


Figure 4-9: Detail plan of module during the evening. (created by author)

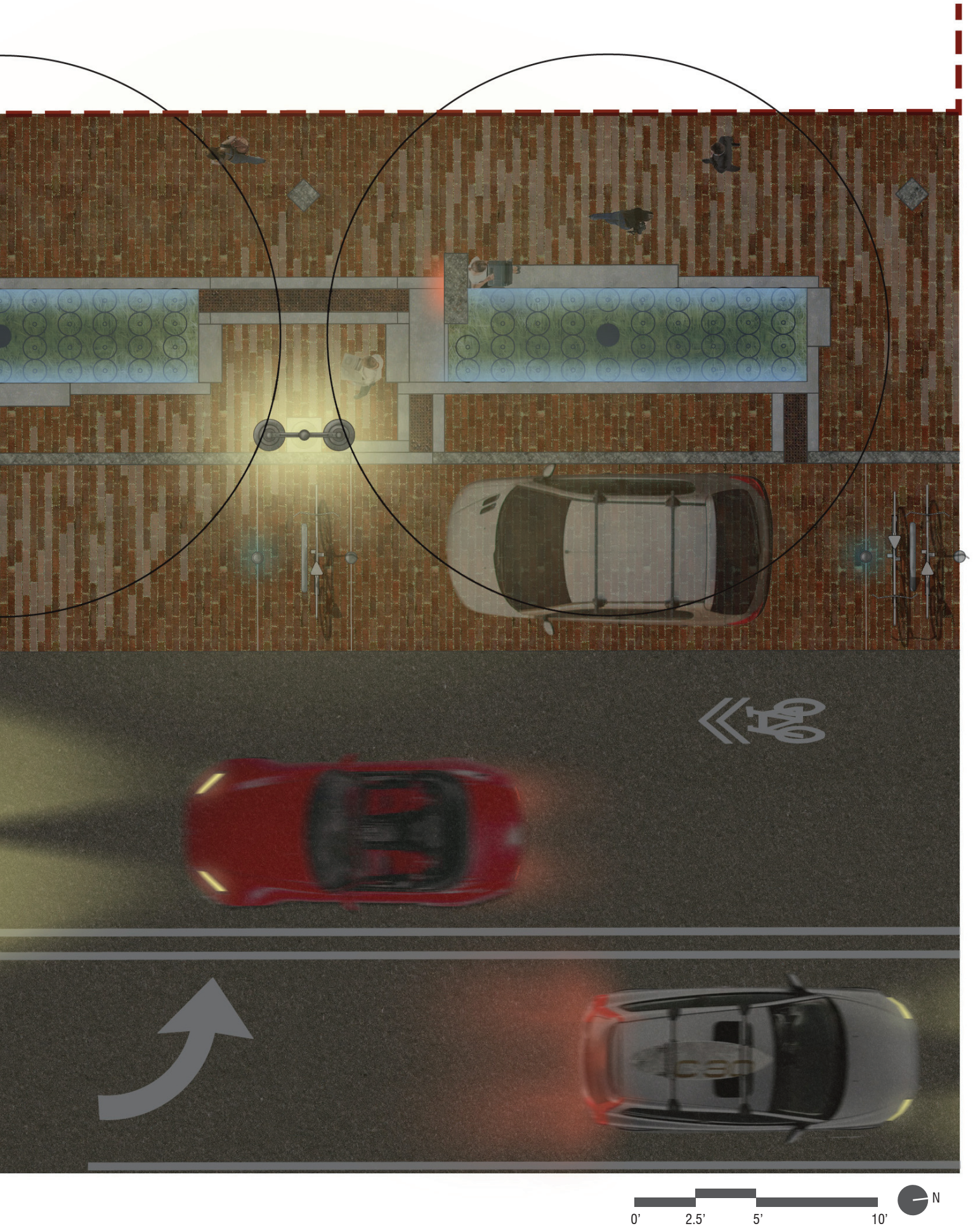




Figure 4-10: Elevation of stormwater planter module illustrating how the design fits into the existing streetscape. (created by author)



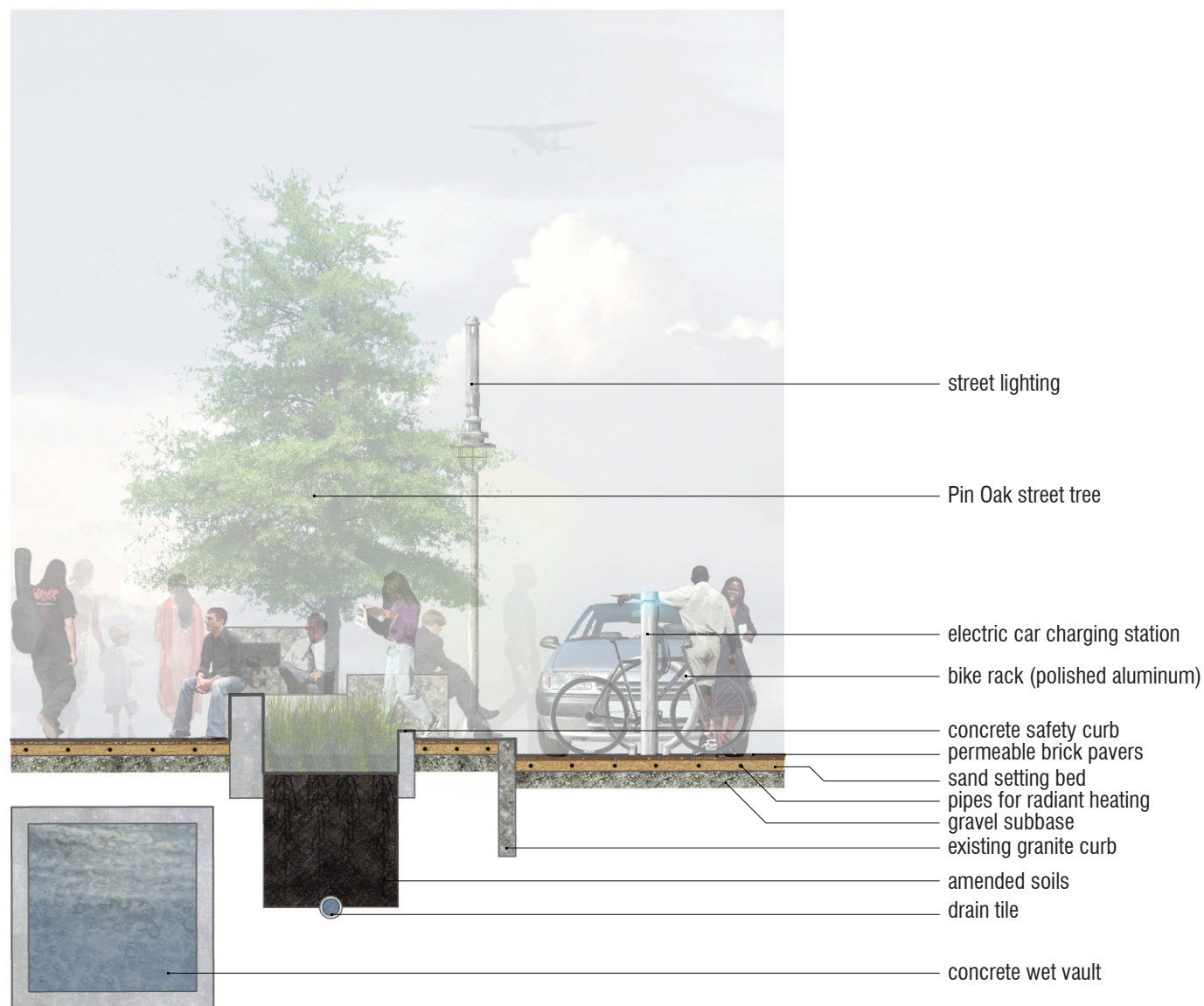


Figure 4-11: Transverse section of sidewalk improvements. (created by author)

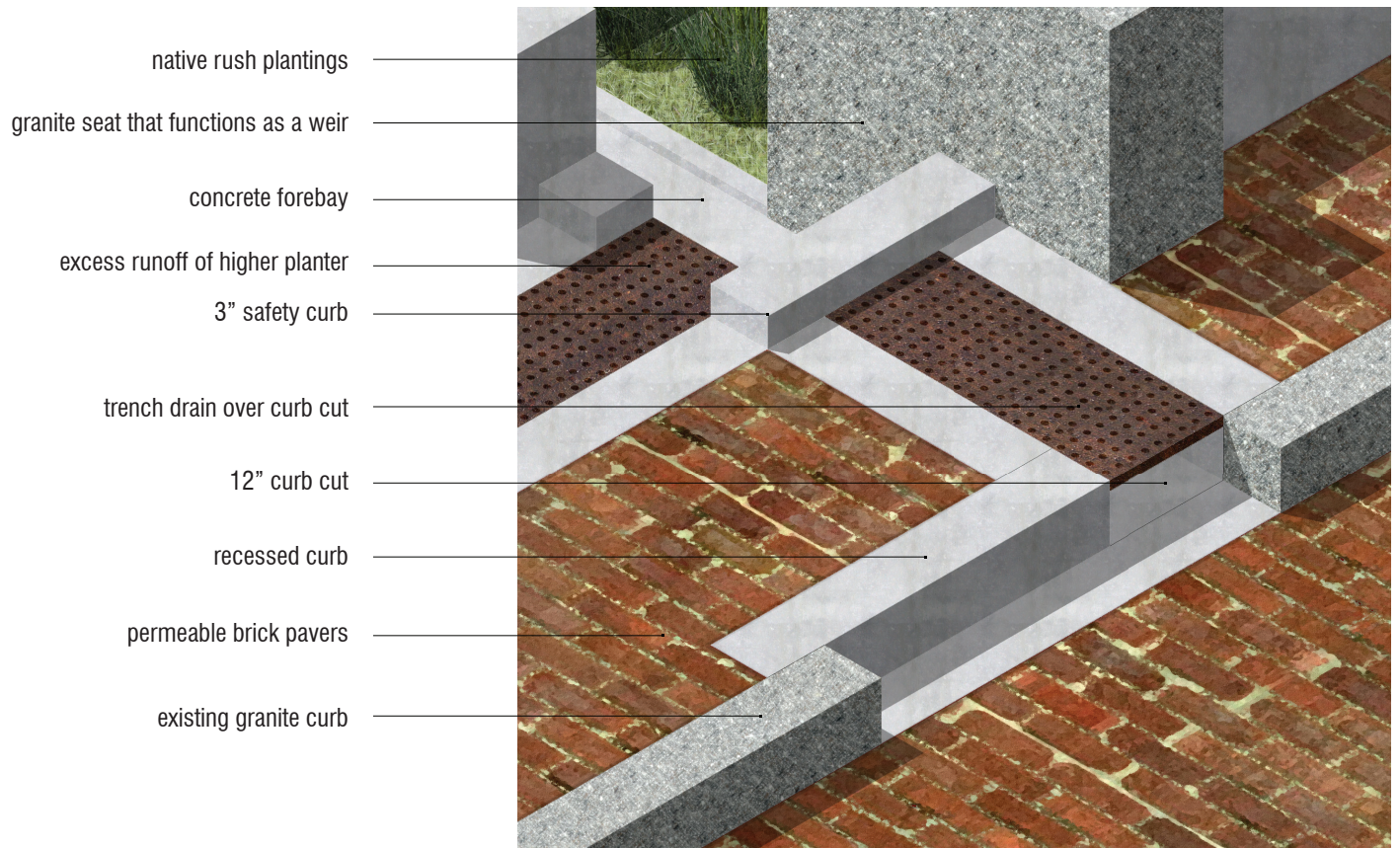


Figure 4-12: Detailed view of recessed curb cut designed to channel runoff into storm-water planters. (created by author)



Figure 4-13: Detail site plan for Humphrey St. intersection. (created by author)

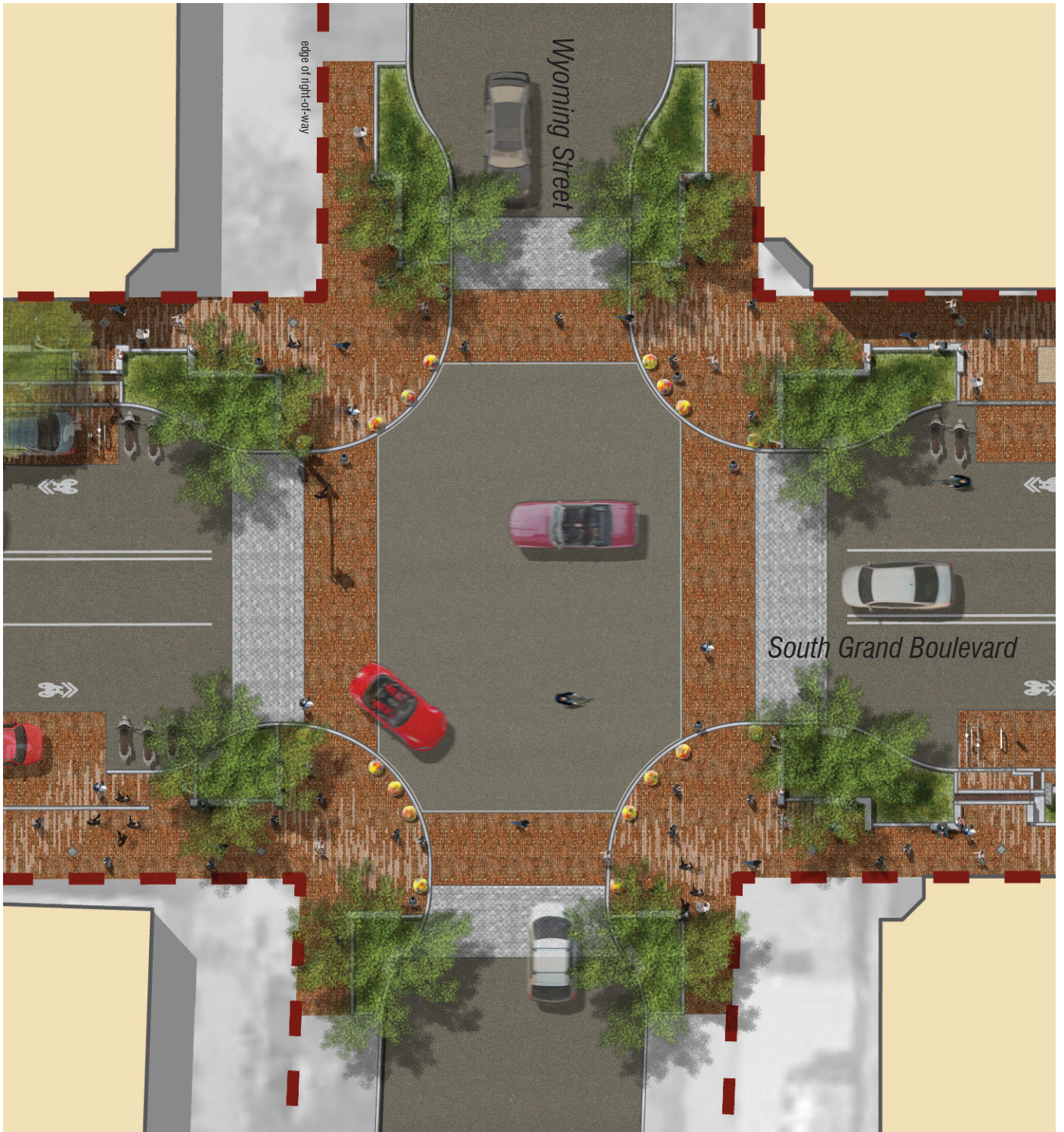


Figure 4-14: Detail site plan for Wyoming St. intersection. (created by author)





Figure 4-15: View from Humphrey St. intersection of a "dynamic user" pumping water into the stormwater planter during a period of time with no precipitation. (created by author)





Figure 4-16: Detail plan of steet block containing the educational pocket park. (created by author)





Figure 4-17: Perspective view from within the educational pocket park.
(created by author)



5

EVALUATE

EVALUATE

APPLY

SYNTHESIZE

PROGRAM

ANALYSIS

CONCEPTUALIZE
ALTERNATIVES

DESIGN

REFINE

PRODUCE

APPLY METRIC
TO DESIGN

COST-BENEFIT
ANALYSIS

IDENTIFY

UNANSWERED
QUESTIONS



evidence discovered
knowledge app

Evaluation

Designed to one day attain the meaning level of user orientation, therefore optimal resiliency, the design proposal for South Grand Boulevard uniquely addresses varying concepts at each level of the Hierarchy of User-oriented Streets framework. As mentioned in the introductory text of the apply section, text descriptions pertaining to the design concepts have been reserved for the evaluation section. In this manner, the design proposal as a whole is able to be broken down and analyzed through the framework regardless of which scale the drawings are communicated at. Trying to present graphics that focused on only one level of the framework was not feasible as the symbiotic overlap of the components within each level establishes the richness of the design.

The following summarizes the key ideas within the design proposal. The intent is for many of the ideas previously presented in earlier stages of the design process to tie into actual design decisions. As such, the inclusion of figure and page numbers referencing additional content within this report builds a stronger representation of the ideas embodied by the proposed framework. Beginning with function, arguments will be constructed for each level of the framework. Certain components will have quantified data to back up the design decisions. These numbers go far in arguing why the proposed framework is a valuable tool for designing urban rights-of-way projects.



Function

Two important concepts revolve around the function level of the proposed framework. First, the 3-lane configuration proposed by Design Workshop is adopted as a point of departure. Through the use of online surveys and electronic polling at public meetings, Design Workshop was able to base many of their design decisions upon quantitative data. When asked about the success of the pilot test, “73% of participants felt the pilot test should continue until permanent construction next year [2010] (Workshop 2010, 67). Clearly, a majority of community stakeholders consider the 3-lane con-

cept to function correctly. For this reason, Design Workshop’s concept is adopted into this design proposal. Second, the limestone foundations of the buildings are protected through the strategic placement of underground wet vaults beneath the sidewalk (see Figure 4-11). In this case, a component that fulfills a major role in both ecology and meaning protects the building foundations from the increased volume of water to be infiltrated into the subsurface. The importance of this concept should not be overlooked if one desires to introduce higher level components into the design. Users will not support “green street” eco-technologies if their inclusion into the streetscape creates high risks for the failure of building foundations.



Safety

As previously mentioned, Design Workshop’s proposal excelled at both the function and safety levels of the proposed framework. While few changes took place at the function level, the proposed design enhances the degree of user orientation at the safety level with several new ideas. Early on in the conceptual design stage, the potential benefits and overall practicality of a “woonerf” were researched. Woonerfs can be defined as narrow streets that remove all curbs and sidewalks requiring pedestrians, cyclists, and motorists to share the space at one time. As evidenced in Europe, specifically the Netherlands, woonerfs are most successful in residential neighborhoods with speeds of 10 mph or less (Smart Growth Solutions n.d.). Due to the relatively high vehicular speeds and daily vehicular traffic volumes existing along South Grand Boulevard, this traffic calming strategy is not suitable; however, the value of this initial investigation should not be discounted as it led to the discovery of several sources for other traffic calming measures.

In addition to the intersection bulb-outs proposed by Design Workshop, seven raised street intersections acting as “speed tables” signify to the traveling motorists that they need to slow down and pay

closer attention to the many pedestrians within the six-block area. Designed for maximum speeds of 25-30 mph, “speed tables” essentially act as large speed bumps consisting of large ramps that access a raised flat top (Smart Growth Solutions n.d.). Currently, the posted speed limit within South Grand’s business district is 25 mph. As such, raised intersections are suitable for announcing to motorists that they are not the sole occupant of the roadway. Additionally, multiple pedestrian users have been observed crossing the street in places other than the designated crosswalks located at each intersection. When pedestrians participate in this behavior, they are putting themselves and others in harm’s way. The incorporation of raised intersections attempts to remedy this safety concern through continuing the elevation and paving material of the sidewalk through the intended crosswalk zones. Ideally, the greater degree of emphasis upon the pedestrian crossing will lead to a reduction in the number of users who casually cross the busy street wherever they see fit. Regardless of whether the raised intersections convince pedestrians to cross at the proper locations, motorists will be forced to slow their speed and pay closer attention to their surroundings.

Following the inclusion of raised intersections, a second concept within the safety level of the proposed framework is a dispersion of bike parking throughout the entire district. Rather than placing multiple bike racks in one or two vehicular, on-street parking stalls on either end of each block, this design proposal alternates bike parking with vehicular parking down the length of the block (see Figure 4-8). After searching for a precedent of this idea, the only example came from imagery in Europe where people park bikes, motorcycles, mopeds, and even smart cars perpendicular to the curb face in the narrow spaces left between two parked vehicles. Besides Europe, two separate site visits revealed that in certain areas of South Grand, users park mopeds and motorcycles up on the sidewalk impeding pedestrian circulation. Obviously, some users attempt to use leftover spaces within the right-

of-way. Instead of ignoring these users, this design proposal thinks about how the on-street parking space can relate more to the pedestrian sidewalk than the vehicular roadway.

The initial presentation of this innovative concept encountered immediate skepticism from this report’s committee members. Preferring the conventional approach of grouping multiple bike racks together in a single location, the committee leveled several criticisms against the idea of dispersing bike parking throughout each block. At this point in time, two options existed for appropriately responding to the critical feedback. First, the radical idea could be either completely abandoned or diluted in pursuit of more conventional approaches. Second, the criticism could be harnessed as a motivator for exploring the radical idea in further detail with the goal of constructing stronger arguments for why it is the better option over the conventional approach. Favoring the latter of these two options, the design proposal maintains the dispersion of bike parking throughout the district.

Many arguments support the bike parking concept as a viable option for increasing the level of user orientation at South Grand. First, motorists parking their vehicles for some period of time can rest assured that their car is safe from other vehicles either hitting it or pinning it in with little to no room to safely pull out of the parking stall. Second, entering and exiting the vehicular parking spaces will be easier than conventional on-street parking. With ample room to park, a motorist will easily be able to signal and pull out of the parking stall without worrying about hitting the car in front or behind him/her. Finding a parking space would also be easier as the size of every space is guaranteed to be the same every time. In other words, if one sees an open parking stall, they should be able to park there without any question of whether or not their vehicle could fit. Third, the design proposal embraces a stronger spatial design integrating the on-street parking stalls into the rhythm of the stormwater planters (see Figure 4-8). As a result, transitional threshold spaces are created adjacent to each bike

parking zone framed by two stormwater planters. Fourth, the dispersion of bike parking will eliminate the need for cyclists to chain their bikes to street trees, parking meters, light posts, and other available elements. Bike racks are within close proximity of any destination within the district. Finally, while it was previously mentioned that no design precedents could be found for the alternating placement of bike parking in between vehicular parking, further research revealed a couple of precedents projects that actually placed street trees between vehicular parking stalls due to narrow right-of-way conditions. One of Design Workshop's early schematic designs for South Grand even explored the option of placing street trees in between vehicular parking stalls. If street trees can be incorporated into the on-street parking zone, why is it wrong to similarly incorporate bike parking into these spaces?

One anticipated criticism from community stakeholders is the loss of 18 vehicular parking stalls along South Grand Boulevard. This is a significant hurdle to overcome as the results of Design Workshop's public polling reveal that business owners equate greater access and visibility with greater profits; however, contrary to their beliefs, the introduction of bike parking actually allows South Grand Boulevard to increase the maximum capacity of its on-street parking by 40 users. Design Workshop's proposal designated 81 vehicular parking stalls. By replacing 18 of these stalls with 92 bike parking stalls, the design proposal within this report has the potential to accommodate 184 additional users. Of course, most bicycles only allow one person to ride at a time while vehicles can hold many more. Still, by calculating the maximum potential number of users for both scenarios, the latter design has a greater capacity of parking. Assuming each vehicular parking stall represented eight users while each bike parking stall represented only 1 user, the capacity for each design is 648 users and 688 users with the latter being the one with bike parking. Although it will be a tough sell to the community stakeholders, quantitatively presenting data like this establishes a designer's credibility and trust

with the client.

Following the dispersion of bike parking concept, the third safety component incorporates radiant heating into the sidewalk and on-street parking zones. Placed within the sand setting bed of the permeable brick pavers, flexible piping filled with warm water passing through it raises the local temperature of the ground plane. Incorporated into a geothermal system, the radiant heat will greatly reduce the need for commercial shop owners to shovel sidewalks and throw down harmful salts and deicing chemicals during the winter months.

Extracted from Design Workshop's proposal, uniquely designed parking stalls for people with disabilities presents a fourth safety component. At the safety level, all users are designed for, not just those who possess typical mobility. Though not enhanced in the design proposal, these parking stalls have been consciously safeguarded from their removal. Figures 4-4 through 4-7 illustrate how the eco-technologies work around important safety components such as extra-wide parking spaces for those with mobility impairments.

The addition of user seating and a 3" tall safety curb around the stormwater planters presents the final two components at the safety level. Currently, South Grand has no seating other than a low retaining wall located in front of the multi-story residential building at the Utah Street intersection. This design proposal provides 1,858 linear feet of seating. Assuming two linear feet per seat, this design proposal provides a total of 929 seats in comparison to 337 seats proposed by Design Workshop. The 3" tall safety curb encompassing the perimeter of each stormwater planter protects people from falling into the sunken planter. The inclusion of these safety elements as well as the function elements allows the designer to successfully introduce ecological processes into the urban right-of-way.



Ecology

Emphasizing the hydrological processes of the site, the design proposal for South Grand incorporates several eco-technologies. Stormwater infiltration planters capture stormwater runoff from the roadway and sidewalk. Similar to the 12th Avenue Green Street Project located in Portland, Oregon, runoff enters the planter through a curb cut on the high side of the street. While similar in size and purpose, the design of the planters at South Grand differs in a few key areas. First, although water enters the planter in similar manner, it does not exit in the same way. For instance, rather than flowing back onto the street after ponding to a depth of 7", runoff exits the planter parallel to the curb alternating from one planter to the next in a meandering sequence (see Figure 4-8). A second key difference between the precedent and the proposal involves the way in which excess runoff from larger storm events is handled. In the precedent, excess runoff enters the existing sewer once the system reaches its capacity. In contrast, the South Grand proposal captures excess runoff in a wet vault located underneath the sidewalk. Then, in dry conditions between storm events, the water will be pumped back into the beginning of the treatment train system. As a result, South Grand becomes a zero-runoff urban right-of-way.

This statement can be quantitatively proven by calculating the total volume of runoff (at a specified storm event) for the proposed design and subtracting the total volume that the stormwater planters can hold. Referencing the hydrology analysis (see pages 77-78), one can observe the total volume of runoff for a 20 year, 20 minute storm event to be 18,352 cubic feet (CF). The same method of separating out pervious and impervious surfaces per each catchment area for the proposed design yielded a total runoff volume of 14,695 CF. Disregarding soil infiltration rates, the stormwater planters can accommodate 9,410 CF of the total runoff volume leaving 5,489 CF remaining. The excess runoff will enter into the wet vaults underneath the sidewalks

with an estimated remaining capacity of 69,636 CF for the capture of rooftop runoff or larger storm events. As evidenced here, the eco-technologies successfully work together to capture and infiltrate every drop of water that lands within the right-of-way.

In order for the entire system to work properly, several details have been incorporated into the design. First, information gleaned from the analysis of the 12th Avenue Green Street precedent allowed for a better design of getting water to turn 90 degrees at the curb cut. As you may expect, a concentration of water flowing along the curb face tends to not make sharp, abrupt changes in direction. To remedy this limitation, the precedent placed small asphalt berms on the low side of the curb cut. While this slight modification seems to be working, a better idea would be to inset 2.5 linear feet of curb face by 6 inches prior to the curb cut (see Figure 4-12). Consequently, flowing water hits the curb cut perpendicularly and is forced into the planter.

The next two details focus on the idea of water quality and ease of maintenance. Each stormwater planter includes a forebay on the uphill end of the planter. Constructed of concrete, the forebays capture sediment and debris allowing for their easy removal. If ecological processes are to be successfully introduced into the urban environment, ongoing maintenance must take place. The second detail that works in conjunction with the forebay is the alternating use of signage and seating elements as weirs. The strategic placement of these elements dissipates the velocity of incoming runoff from the higher stormwater planter resulting in less erosion and higher water quality levels. Additionally, this detail provides an opportunity for user interaction with the eco-technologies as audible sounds can be heard from the flow of water hitting the weirs.

Besides the stormwater infiltration planters, a second component of the ecology level is a significant investment in the district's urban forest (see Figures 4-2 and 4-3). The existing Honeylocusts (*Gleditsia triacanthos* var. *inermis*) are in poor condition offering only an average

return to the city in terms of net annual dollar benefit. As a result, Pin Oaks (*Quercus palustris*) and Sycamores (*Platanus occidentalis*) are selected as tree species for the linear stormwater planters and intersections respectively.

Both of these species are top performers in terms of their cost-benefit to the city of St. Louis (Bess 2009). According to data extracted from the *City of St. Louis, Missouri, Street Tree Resource Analysis*, the net annual benefit of the existing Honeylocusts is \$3,920.62. Design Workshop's proposal obtained a net benefit of \$7,034.04. This design proposal for South Grand obtains a net benefit of \$12,255.18 (see Figure 2-64). As evidenced by these numbers, the proposal within this report offers a far greater return on the city's investment than the other two scenarios. Though an initial goal of this project, an in-depth cost-benefit analysis through time was not possible due to time constraints. More emphasis should be placed on this type of post-design analysis as it will allow landscape architects and urban planners to construct stronger arguments for their design decisions.



Genius Loci

Having addressed the lower levels of user orientation, designers can introduce genius loci components into the design with the intention that through time these elements will aid in the development of a "community of users." Specific design ideas include painted spherical bollards at the raised intersections, electric car charging stations, the use of local materials, expressive paving patterns, and the incorporation of lighting into the stormwater planters.

Figure 4-15 illustrates the context in which the painted spherical bollards are placed. The inspiration for these components evolved from both the need to provide safety to the pedestrians on the sidewalk and observations made of the community's desire to artistically express themselves. In their 30-day pilot test of the 3-lane concept, Design Workshop placed concrete barricades in the locations where

curb bulb-outs would be once constructed. In the time since the pilot test, community members have decided to paint varying designs on the barricades. The result is a unique microclimate observable at each intersection. Inspired by the artistic inclination of the district, the proposed design incorporates the painted, spherical bollards as a symbolic representation of the painted concrete barricades that once existed at each intersection. Furthermore, the intention is to place bland, concrete spheres in the right-of-way without any aesthetic treatment by the designer. Members of the community can then present their ideas to South Grand's Community Improvement District (CID) for what artistic expressions might be painted onto the bollards at each intersection. Ideally, the CID will select a local artisan for the execution of the art installations. Should the CID choose to, they could easily update the appearance of the bollards after some time has passed to foster a continual interest for users who are intrigued by the dynamic nature of South Grand's unique nodes of creativity and expression.

A second genius loci component is the incorporation of electric car charging stations into the rear bollard of all on-street vehicular parking spaces along South Grand. By adding this higher level design component to the previously presented list of arguments for the alternation of bike and vehicular parking, criticisms pertaining to increases in cost are sufficiently addressed. By incorporating necessary infrastructure for the rising demand of electric cars, South Grand has an opportunity to go after "green" tax credits offered by the federal government. Furthermore, in addition to being a potential funding source for the project, the electric car charging stations help to brand the district as progressive and sophisticated within the regional marketplace. This new image would be unique from all other competing business districts in the area resulting in increased economic profits as people visit South Grand as an eco-tourism destination.

Important to the identity of South Grand as a place, not a thoroughfare, the selection of local materials sets the district apart from

many other streets constructed primarily of concrete and asphalt. Existing granite curbs are recycled in the design proposal. Additional uses of granite are reserved for the signage and seating elements that function as weirs in the stormwater planters and the sculptural fountains in the educational pocket park. In being highly selective about which design elements would be constructed with this expensive material, the proposal calls attention to important elements within the right-of-way. Red brick pavers, indicative of the great amounts of historic brick construction found throughout the city of St. Louis, are utilized in a highly artistic paving pattern along the sidewalk (see Figure 4-8). Following the movement of water throughout the overall system, a lighter colored brick increases the visual interest of a user's casual stroll through the district. In order to convey the full effect of the meandering, a significant design decision was made to pave the on-street parking space with the same material as the sidewalk, not roadway. The undulating movement in the paving pattern persuades the pedestrian user to believe that the on-street parking spaces are meant for their occupancy. In time, the staging of these genius loci design elements has the potential to build user ownership over the public space.

The culmination of this statement would come to realization when a shop/restaurant owner decides to temporarily give up a highly valuable parking space directly in front of his/her store in order to increase outdoor dining capacity during the evening (see Figure 4-9). By quickly setting up several movable tables, chairs, and plantings (to shield the area from the vehicular travel lanes), the parking stall could easily be converted into a unique dining experience for patrons of South Grand. When a user of the right-of-way takes ownership over the public space to this degree, the district will likely be on the cusp of entering into the meaning level of the proposed framework.



Meaning

Finally, after introducing an appropriate hierarchy of programmatic elements, two meaning components/concepts can be pursued. First, cast iron hand pumps placed at the beginning of the treatment-trains encourage users to personally interact with the stormwater planters. The creation of “dynamic users” requires the development of a “user land ethic” and their subsequent motivation to personally advocate for and maintain the urban right-of-way. The hand pump allows users to physically connect with the site during dry periods with little rain. Observing the stressed appearance of the rushes planted within the stormwater planters, these “dynamic users” will promptly begin pumping water out of the wet vault below and into the system. Of course, visiting users to South Grand will likely observe this behavior as quite strange. Consequently, the “dynamic user” can enlighten the visitors of the importance of maintaining the ecological processes in the district.

The proposed educational pocket park further builds on the potential for users of South Grand to leave the district with a meaningful experience implanted deep within their thought processes. The design concept for the pocket park reaches all the way back to a particular piece of the project genesis (see page 7). An abstraction of the daunting Mississippi River Basin dilemma establishes the stormwater flow patterns and fountain locations within the park. The flow of water is representative of the tributaries that flow into the Mississippi River. The fountains symbolize the independent cities that currently neither coordinate with nor have concern for what happens to cities further downstream. If our country is to overcome its consumptive habits, communication must take place between the independent municipalities. To bring this statement to light in the design, users will have an opportunity to interact with the fountains by stepping on a pressure-sensitive paver in the ground plane. Surprisingly, nothing will happen unless a minimum of two of the five sensors are activated. The outcome is a

highly interactive experience for users as they begin to visually and tactilely understand the importance of one city talking to another city for their mutual benefit. Only when all five sensors are activated will the users have an opportunity to observe the fullest extent of the intended experience.

Unanswered Questions

As the final step in the design process diagram (see Figure i), several unanswered questions are posed below for further investigation and reflection in the future.

- How can the Hierarchy of User-oriented Streets framework become quantitatively relevant to the professions of landscape architecture and urban planning? What are the specific criteria and/or baselines for the components underneath each level of the proposed framework?
- What is the relevancy of the theoretical framework to other project types within the field of landscape architecture (parks, golf courses, community planning, suburban sprawl, gardens, greenways, brownfield sites, etc.)?
- What impact does time have on the proposed design? How does one quantitatively measure this in reference to the cyclical properties of time noted within the framework graphic?

Conclusion

The descriptions and arguments presented in the evaluation section provide evidence of the substantial value that the Hierarchy of User-oriented Streets framework has for the design, construction, and maintenance of urban rights-of-way. In this report, the proposed framework has been utilized throughout the precedent study, the site inventory and analysis, the development of program, the design proposal, and the project evaluation. As evidenced through its application at South Grand, the incorporation of this framework into one's design process yields a substantial return towards attaining resiliency in urban rights-of-way. The Hierarchy of User-oriented Streets framework provides the road map for how landscape architects and urban planners can lead the movement that transforms our cities' infrastructure from functional thoroughfares to resilient places.

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Appendix A

coded design graphics

As referenced in earlier text, the following figures code the imagery contained within the apply section with the icon imagery attached to each level of the Hierarchy of User-oriented Streets framework. In order to gain a full understanding of the design proposal and its theoretical basis, one must return to the information gleaned from both the apply and evaluate sections of this report. The highly visual imagery, the associated text, and the coded imagery work together to convey the usefulness of the proposed framework as a design tool.

While the precedent analysis used colored, fill selections to code specific components in the imagery, this appendix utilizes the icon imagery to show how some components serve dual roles at South Grand. One example is how the granite fountains located in the educational pocket park serve as both genius loci and meaning components. A second example is the function and ecology roles of the concrete wet vaults. As one looks through this appendix, notice that some of the graphics contain only function, safety, and ecology components while others include the addition of genius loci and meaning components. This occurrence supports the earlier observation that attaining meaning within narrow rights-of-way can be difficult and more easily accomplished through the transformation of an adjacent, underutilized parcel into a small pocket park.

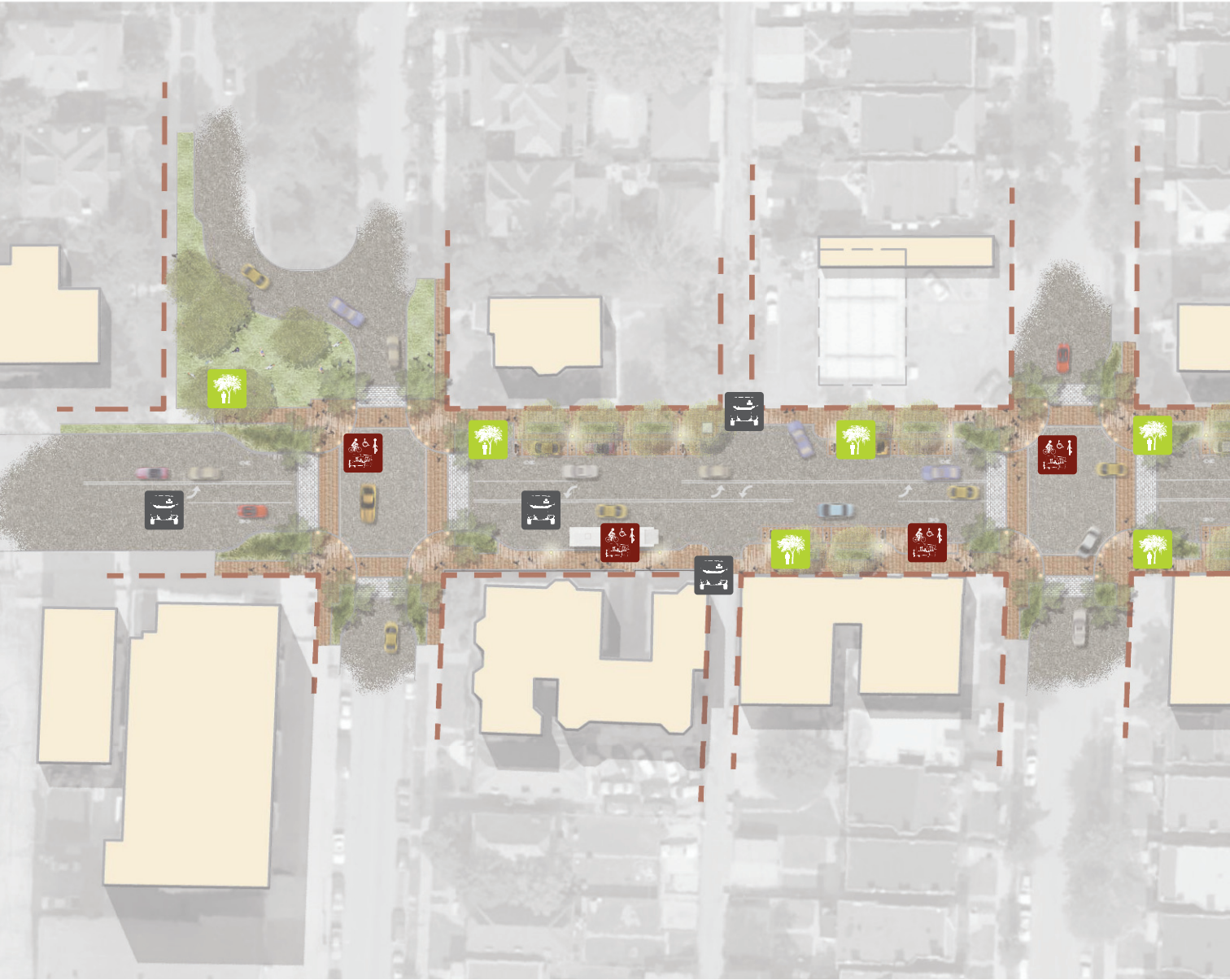


Figure A-1: Coded graphic of proposed master plan for southern portion of South Grand.
(created by author)





Figure A-2: Coded graphic of proposed master plan for northern portion of South Grand. (created by author)



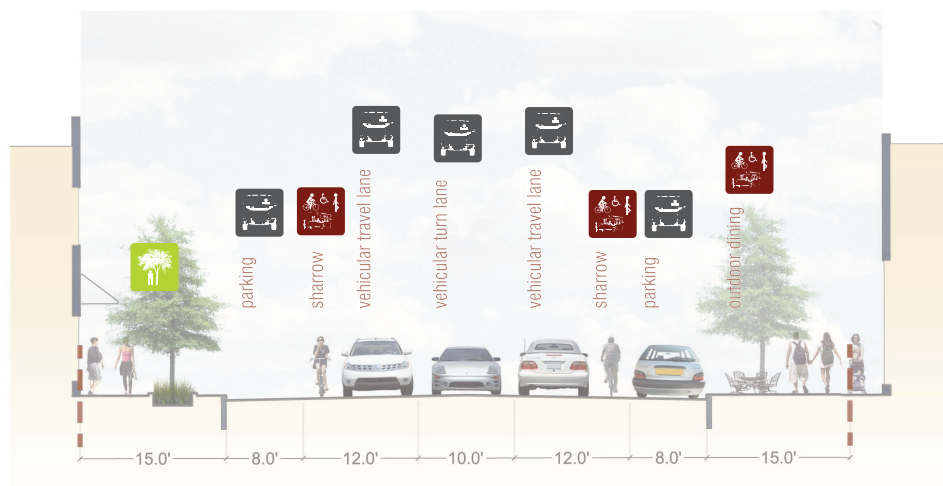


Figure A-3: Coded graphic of section A-A illustrating variances in ecology treatment.
(created by author)

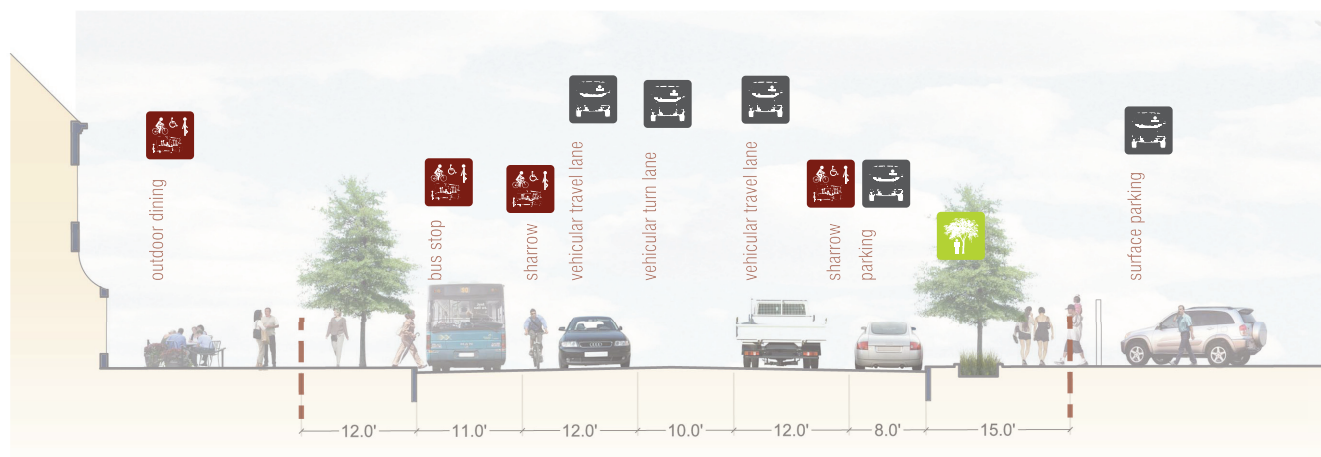


Figure A-4: Coded graphic of section B-B illustrating variances in ecology treatment.
(created by author)

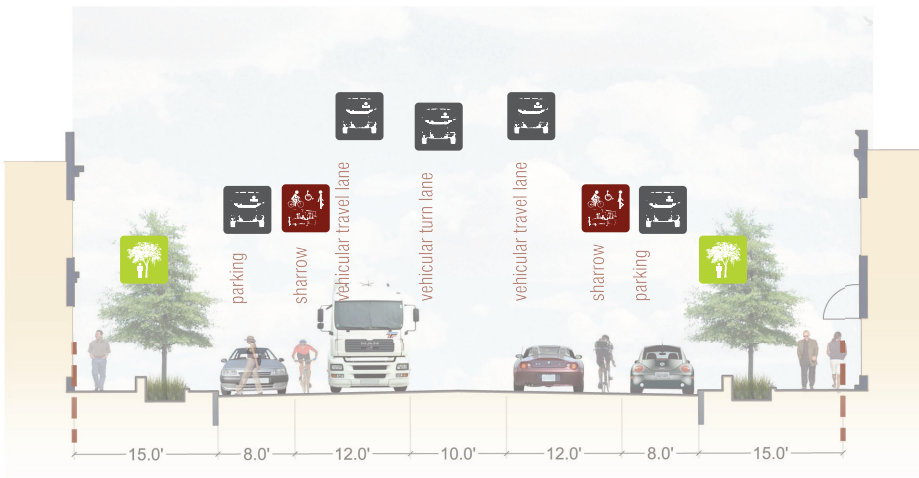


Figure A-5: Coded graphic of section C-C illustrating variances in ecology treatment.
(created by author)

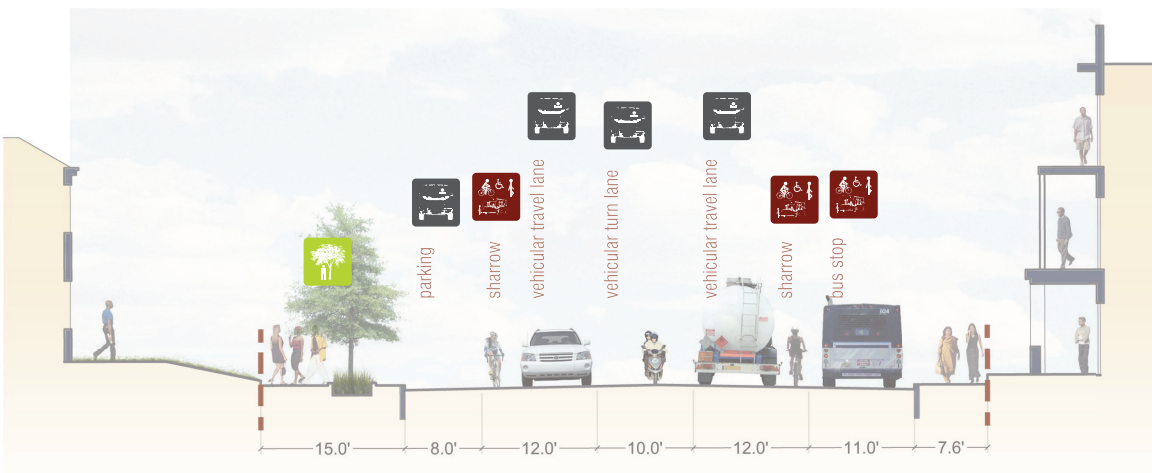


Figure A-6: Coded graphic of section D-D illustrating variances in ecology treatment.
(created by author)

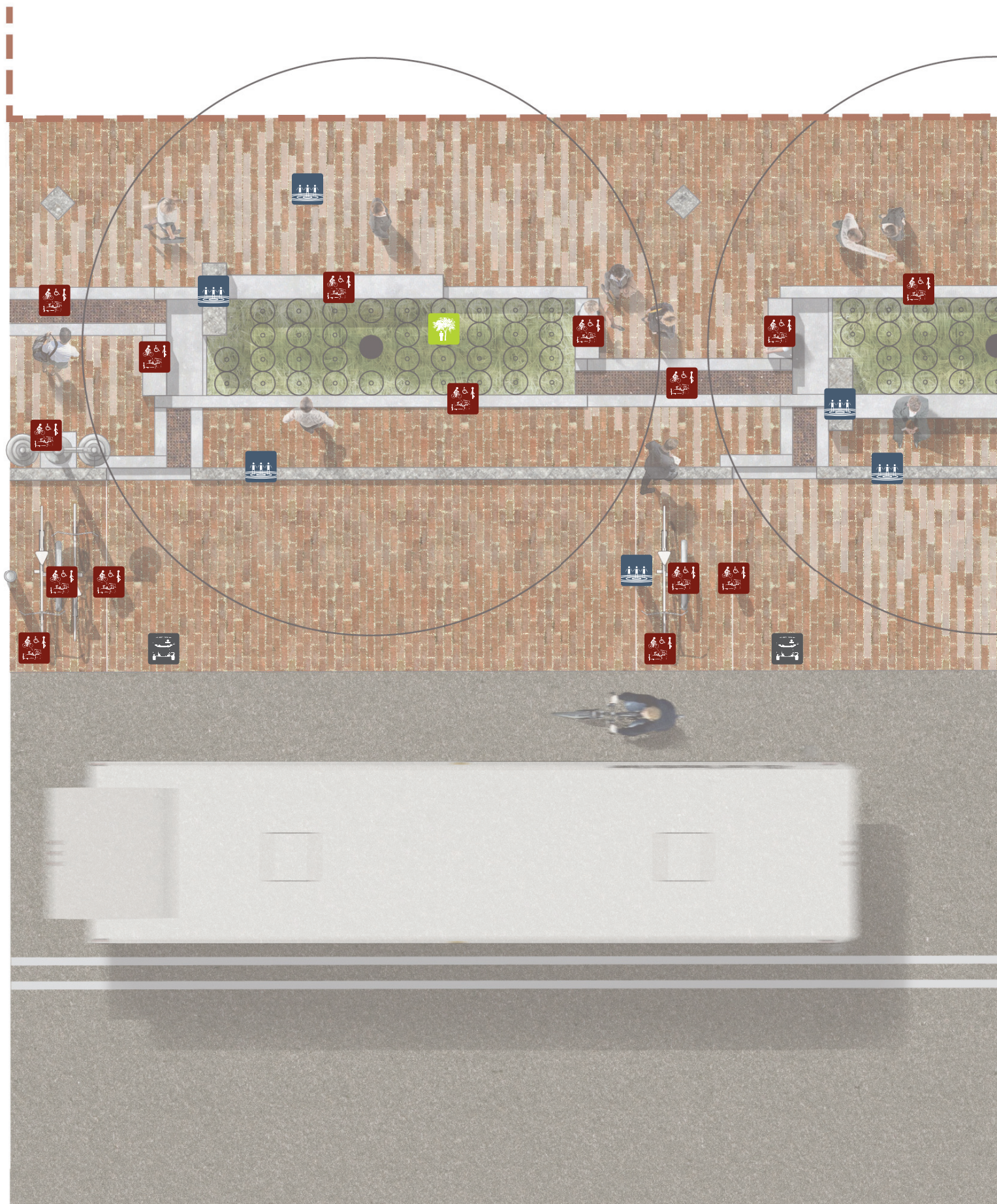


Figure A-7: Coded graphic for detail plan of stormwater planter module.
(created by author)

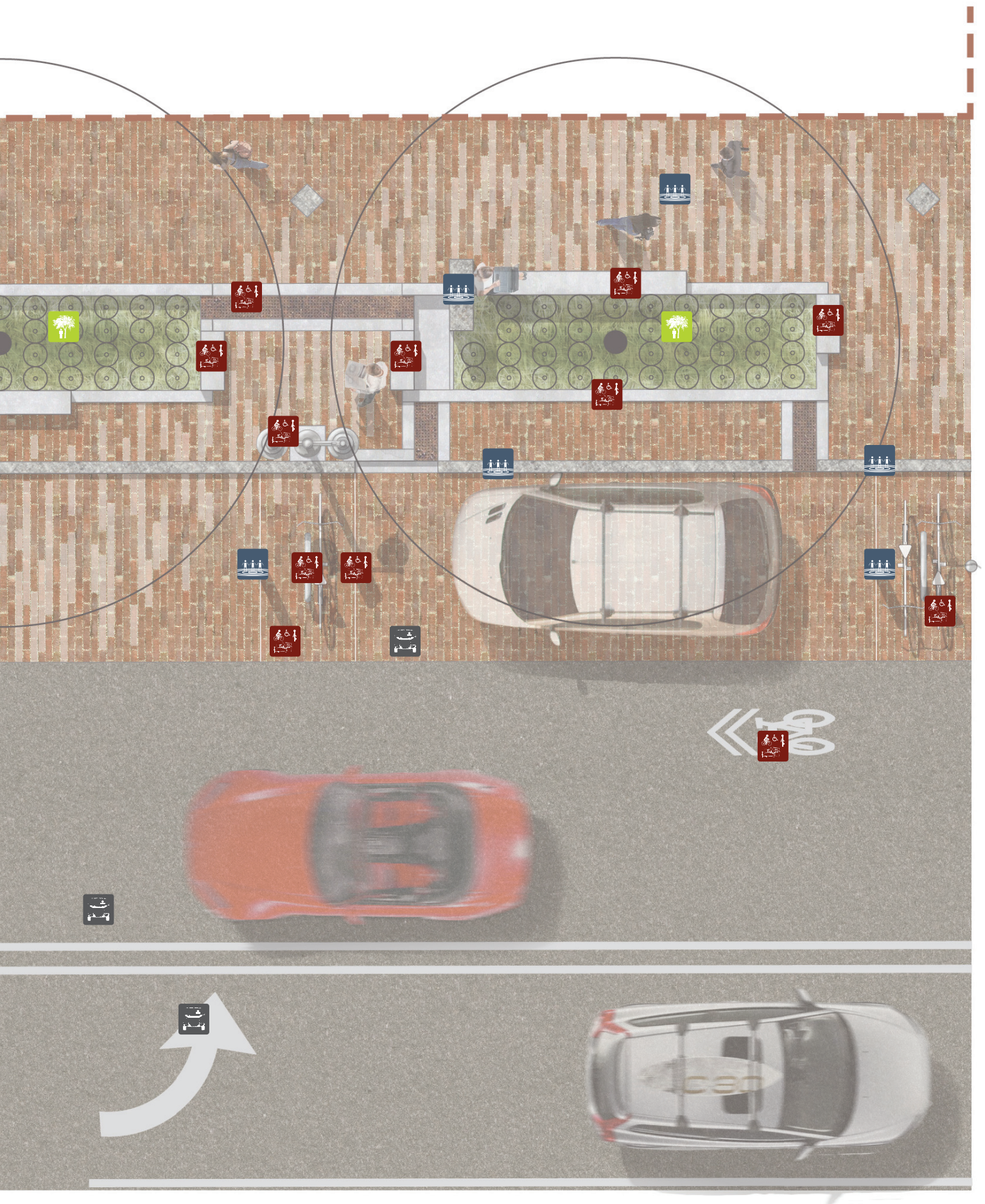


Figure A-8: Coded graphic for detail plan of module during the evening.
(created by author)





Figure A-9: Coded graphic for transverse section of sidewalk improvements.
(created by author)

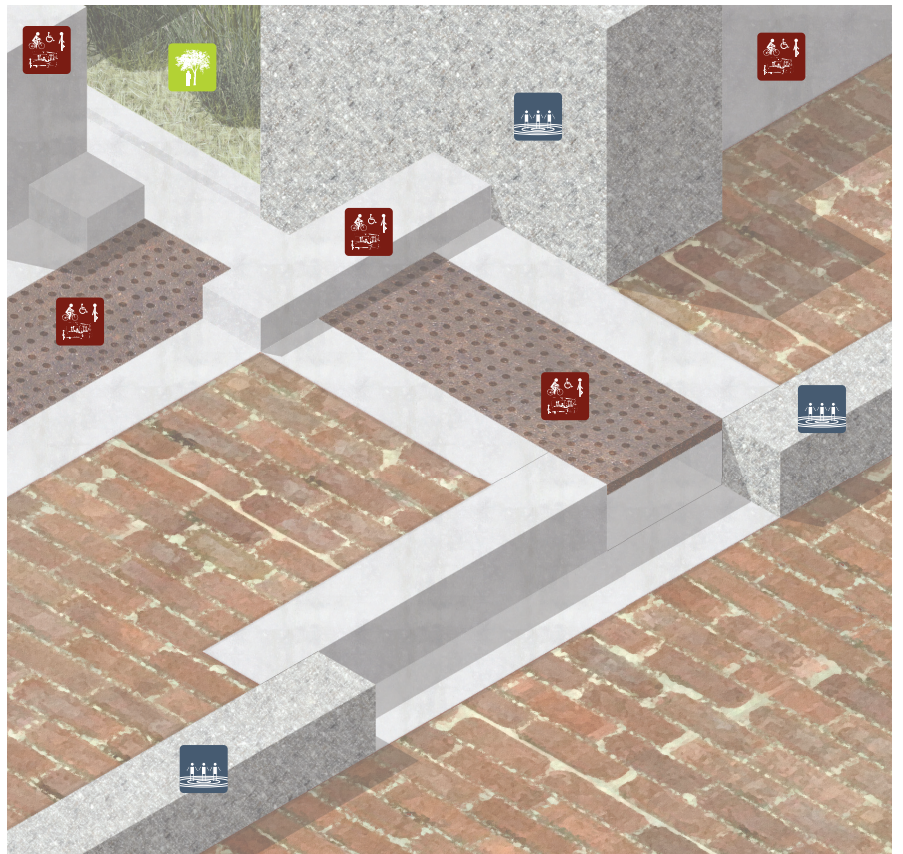


Figure A-10: Coded graphic for detailed view of recessed curb cut designed to channel runoff into stormwater planters. (created by author)



Figure A-11: Coded graphic for elevation of stormwater planter module illustrating how the design fits into the existing streetscape. (created by author)





Figure A-12: Coded graphic of view from Humphrey St. intersection of a “dynamic user” pumping water into the stormwater planter during a period of time with no precipitation. (created by author)





Figure A-13: Coded graphic for detail plan of steel block containing the educational pocket park.
(created by author)





Figure A-14: Coded graphic of perspective view from within the educational pocket park. (created by author)



Appendix B

literature review

An ongoing review of literature throughout the fall 2010 semester has proven to be an extremely valuable tool in providing necessary insight for the development and testing of the proposed theoretical framework. I have been inspired by the written work of varying authors and their associated arguments and perspectives on overlapping topics of discussion. In the reviews below, I present my understanding of the main points in the literature while interjecting my thoughts of usefulness or related inquiries. These primary references, along with other references not reviewed in this section, are cited throughout this document.

City of St. Louis, Missouri Street Tree Resource Analysis **Davey Resource Group | 2009**

In light of the design professions' recent focus upon energy efficient and environmentally conscious designs, a quantifiable cost-benefit analysis of urban forests is now, more than ever, useful in challenging conventional methods and policies regarding the construction of grey infrastructure within urban rights-of-way. During the March of 2009, the Davey Resource Group published its official street tree analysis for the city of St. Louis, Missouri, as a part of the series of Municipal Forest Resource Analysis reports prepared and published by the USDA Forest Service. Using i-Tree's computer application software called STRATUM (Street Tree Resource Analysis Tool for Urban Forest Managers), the Davey Resource Group was able to utilize an existing street tree inventory completed in 2000 as the input for the cost-benefit model. The resulting outputs included many detailed findings, tables, and associated graphs for the city's existing urban forest structure, function, net value, and maintenance needs.

In terms of existing structure, the report states that there are over 133 distinct species growing along the streets of St. Louis with the predominant species being Green Ash (*Fraxinus pennsylvanica*, 15.6%), Pin Oak (*Quercus palustris*, 10.2%), Silver Maple (*Acer saccharinum*,

8.7%), Red Maple (*Acer rubrum*, 8.2%), and Sycamore (*Platanus spp.*, 7.9%). Unfortunately, though the majority of St. Louis' street trees are in good condition (82.5%), the "age structure" of trees is not ideal with few numbers of younger tree replacements. In terms of resource function and value, the report states that "St. Louis' street trees provide cumulative benefits to the community valued at an average of \$59.25 per tree annually, for a gross total value of \$4.4 million annually" (Bess 2009, iv). Furthermore, "the city's street tree population provides a net annual benefit (benefits minus costs) of \$913,660" (vi).

Having access to a resource such as this can truly aid urban planners and landscape architects in presenting their green infrastructure design proposals as investments that appreciate through time. Ultimately, I desire to synthesis relevant portions of the tabular data presented within this report in order that I may quantitatively evaluate a cost-benefit analysis for the street tree portion of my design proposal. This evaluation could then be compared and contrasted with the existing conditions along South Grand Blvd. and DW's final design proposal.

- "St. Louis' street trees are a valuable municipal resource and a critical component of the city's infrastructure. Trees are also an important part of St. Louis' identity and history" (Bess 2009, iii).
- "St. Louis' street trees intercept 261 million gallons of stormwater annually, for an average of 3,530 gallons per tree. The total value of this benefit to the city is \$1.6 million per year, with an average value of \$21.89 per tree" (Bess 2009, v).

South Grand Boulevard Great Streets Initiative **Design Workshop | 2009**

In contacting both Paul Squadrito, the project manager of the South Grand Project at Design Workshop (DW), and Paul Hubbman, a representative of the project's client organization, I received full permission to acquire and utilize any and all information either of them had

in the development of my research design project (see quote below). As a result, I obtained DW's masterplan, a final deliverable given to the client that holistically documents their research, community engagement process, and final design proposal. The introductory chapter of the 132-page document (not including the extensive appendix documenting the public polling/survey process) offers a brief history and overview of prior corridor studies for South Grand Blvd. The next chapter identifies the methods and metrics that were used to evaluate their design proposals throughout the entire process.

Of particular interest to my project was the ability to analyze the data that DW collected from both community stakeholders and users of the site. DW used keypad polling, online polling, and street surveys to receive feedback on their ideas at different stages of the project. After schematically designing nine potential cross-sectional lane configurations, DW used keypad polling devices at an open community stakeholder meeting to narrow their design development focus to only three of the most popular options. One of those options included a reduction from four lanes of vehicular traffic to three lanes. Desiring to understand what the effect would be upon the local community and traveling commuters, DW worked with the city to restripe the roadway and adjust traffic signals within the six-block area for a thirty day pilot test. "At the final public meeting in October 2009, one month after the pilot test, 80 percent of the participants preferred the three lane enhancement" and voted to keep the pilot lane configuration through the completion of the construction project. Community stakeholder involvement was crucial to the success of DW efforts.

- "Jonathan Ryan is welcome to include S. Grand in his study and is welcome to any information you or we may have on the project... This, in my mind, is excellent. The more rigorous study we have, the more we'll learn from this effort" (Paul Hubbman).

"Artful Rainwater Design in the Urban Landscape"

Stuart Echols | 2007

In this article, Echols investigates specific, non-hydrological attributes of award winning precedent projects in the field of stormwater management design. He argues through the concept of "added value" that artful rainwater designs can create projects that enhance both property values and the quality of life for users of the given site. "The idea of artful rainwater design (ARD) is based on the premise that new stormwater management techniques focusing on non-point source pollution, water balance, and small-storm hydrology can be used to create projects resulting in greater user satisfaction and perceived value" (Echols 2007, 103). In other words, he proposes that emerging eco-technologies have the potential to create dynamic urban spaces full of identity while also solving current and future stormwater infrastructure dilemmas.

However, before this can happen, Echols states that there are currently two "critical gaps" that must be addressed by designers. First, designers must overcome their apparent "lack of concern" with the appearance of eco-technologies in urban spaces. Secondly, property owners will not invest their capital in maintaining or constructing additional eco-technologies to which they observe no immediate value added amenity such as higher land values or increased street attractiveness. His conclusion is that public acceptance and/or perceived value should become design criteria when introducing innovative eco-technologies into the urban landscape.

Seeking to answer the question: what attributes of stormwater management design enhance a project's attractiveness and/or value, Echols identifies six design attributes and three community attributes readily observed in his study of twenty-one ARD projects. The six design attributes include ecological legibility (communicates ecological and hydrological function), maintenance strategies (provides specific methods and guidance for upkeep), information systems (provides al-

ternative media to raise stormwater awareness), physical accessibility (encourages people to see, touch, or play with rainwater), multiple use (integrates multiple uses beyond stormwater treatment), and visual integration (creates visual coherence between the form and function of a space). The three community attributes include public awareness (demonstrates a community's existing knowledge about stormwater), perceived value (creates recognized added economic value), and municipal commitment (creates positive agency action and inter-agency cooperation). I plan to use these attributes as a part of evaluating my design proposal for South Grand.

- “Innovative rainwater design can be used to create places recognized as beautiful, meaningful, and educational” (Echols 2007, 104).
- “There is no place for the attitude ‘stormwater management should be left to engineers, or wetland design should be left to landscape architects.’ History has clearly shown that employing a single-disciplined approach to design more often than not leads to failure of the design” (Echols 2007, 104).

“From Stormwater Management to Artful Rainwater Design

Stuart Echols and Eliza Pennypacker | 2008

Echols and Pennypacker introduce this article with a definition of “artful rainwater design” (ARD). They define the term as the employment of “environmental BMPs in designs that call attention to stormwater management in ways that educate and delight those who visit” (Echols and Pennypacker 2008, 268). Following the inclusion of a staggering statistic about the amount of water pollution from non-point sources such as urban runoff, they quickly frame two disparate options for how designers can introduce a “new paradigm of small, safe, integrated BMPs that manage runoff close to the source.” The first option consists of concealing these BMPs in underground pipes

and vaults. The second, more preferable option, considers these BMPs to be site amenities on the surface that can increase the identity and attractiveness of a place.

Realizing that very little literature is published on the amenity goals of ARD when compared to the vast amount concerning utilitarian goals, Echols and Pennypacker seek to further understand and identify design techniques associated with the five amenity goals: education, recreation, safety, public relations, and aesthetic richness. In their study of twenty award winning ARD projects, they catalog their findings of objectives and design techniques according to each goal.

In terms of the education amenity goal, the authors suggest that user learning can take place through the installation of didactic signage or through strategically programming the eco-technologies to invite the user to interact in various activities. An appropriate context for learning is necessary for the latter of the two approaches. Intentionally designing places for gathering in close visual and tactile proximity to the eco-technologies will help to stimulate the users’ curiosity about South Grand’s integrated ecological systems. I am intrigued by the authors’ descriptions of what constitutes a context for learning. User education is an important goal of my design proposal as I look to create an environment that over time will reach a high level of meaning and therefore resiliency. Furthermore, I wonder if there is potential for both a temporary installation of didactic signage (no longer than 1-2 years) and a programmed context for learning to be used in conjunction with each other for the ultimate goal of achieving user education.

Following education, Echols and Pennypacker present their findings on recreation, safety, public relations, and aesthetic richness amenity goals. Recreation is in many ways nuanced with the educational “context for learning.” By encouraging users to physically interact with the eco-technologies, opportunities for ecological education arise. The article’s discussion of safety reinforced my beliefs that designers should consider the health, safety, and welfare of all users as a pre-

requisite to introducing higher level program elements within ecology, genius loci, and meaning. In regards to public relations, this article has inspired me to think about how South Grand's historic business district could rebrand its marketing identity through innovative eco-technologies that say "we care," "we are progressive," "we are smart," "we are sophisticated." This, in turn, could give the district a unique, competitive edge against other business districts within St. Louis. Finally, the aesthetic richness of how water is celebrated throughout the eco-technologies could lead to a more pedestrian-scaled environment enhancing the district's desire to become a destination.

Overall, this article is a great resource for looking at multiple case studies of recent projects that implement a higher degree of user orientation. Most importantly, this article has influenced my thinking upon the potential program elements in the "meaning" level of my proposed theoretical metric for hierarchically ranking urban rights-of-way according to their increased level of user orientation.

- "Although many view industrial activity as the major culprit in water pollution, 70 percent of water pollution in our country comes from non-point sources such as urban runoff" (Echols and Pennypacker 2008, 268).
- "We contend that it is worth the effort, providing landscape architects the opportunity to be good stewards of land and water while creating meaningful places for people to experience" (Echols and Pennypacker 2008, 288).

Immortal River: The Upper Mississippi in Ancient and Modern Times

Calvin R. Fremling | 2005

In this book, Fremling provides a comprehensive, historical context for how the Upper Mississippi River Basin has changed through time with the rise of human development. He desires to draw attention

to "the natural and human-induced processes that have shaped the river and its ecology" (Fremling 2005, 7). Through his historical accountings and shocking statistics, Fremling articulates a sizable dilemma in "how to satisfy increasing demands on a diminishing resource." Furthermore, he presents compelling evidence that in recent history, the frequency and magnitude of flooding has increased resulting in higher and higher economic costs for choosing to ignore the river's natural processes. Instead, humans have engineered a series of flood control measures from levees and floodwalls to reservoirs and dams. Ultimately, I have taken away from this book the understanding that our conventional methods and policies for flood control are not enough in terms of the long-term sustainability of this resource. Though my project site is much smaller and seemingly insignificant in comparison to the scale of the dilemma Fremling presents in this book, I do believe that South Grand can become a visionary demonstration project within the city of St. Louis for managing urban stormwater runoff at the source.

A Sand County Almanac

Aldo Leopold | 1966

Regarded as one of the most influential, foundational literary works of the modern conservation movement, *A Sand County Almanac* provides my research project a strong basis in understanding the components of a land ethic. In this book, Leopold states that "there is as yet no ethic dealing with man's relation to land and to the animals and plants which grow upon it" (Leopold 1966, 238). While human beings have come a long way in developing ethical principles in relation to slavery, women, children, and other races, we need to expand our ethical worldview to include the natural environment as well. Centering his ethical discussion on the definition of community, Leopold argues that soils, waters, plants, and animals collectively represent the land. Rather than seeing ourselves as conquerors of land, we should con-

sider ourselves as interdependent components of a larger community. Defining conservation as “a state of harmony between men and land,” Leopold criticizes the conservation movement of his time for not progressing quickly enough beyond propaganda-filled oratory (Leopold 1966, 243). He alludes to the fact that both the amount and content of conservation education is lacking. Leopold’s discussion surrounding the development of a “land ethic” is important to consider in my project as I strive to design a place that cultivates user land ethics within the urban fabric. Far too many people live their lives in urbanity with little regard as to the devastating effects that their wasteful lifestyle choices make upon the ecosystems and natural habitats further downstream.

- “All ethics so far evolved rest upon a single premise: that the individual is a member of a community of interdependent parts. His instincts prompt him to compete for his place in the community, but his ethics prompt him also to co-operate (perhaps in order that there may be a place to compete for). The land ethic simply enlarges the boundaries of the community to include soils, waters, plants, and animals, or collectively: the land” (Leopold 1966, 239).

“Sustaining Beauty. The Performance of Appearance: A Manifesto in Three Parts”

Elizabeth K. Meyer | 2008

In this manifesto, Meyer advocates for a paradigm shift in what we consider to be sustainable landscape design. She argues “that it will take more than ecologically regenerative designs for culture to be sustainable, that what is needed are designed landscapes that provoke those who experience them to become more aware of how their actions affect the environment, and to care enough to make changes” (Meyer 2008, 6). In this central argument, Meyer establishes a revolutionary claim that the mere inclusion of ecology will not bring about the societal changes necessary to restore our wasteful cities. Rather,

ecology should be understood as the means by which designers can construct user experiences that encourage them to ponder about their role in the world. In other words, ecology is the link between lower levels of user orientation such as function and safety and higher levels such as *genius loci* and meaning. It is at the highest level of user orientation that designers are able to instill in people the desire to become motivated, dynamic components of the spaces they daily inhabit. In this way, designers could begin to treat the infectious disease rather than the undesirable symptoms of our wasteful cities. Throughout her manifesto, Meyer grounds this multifaceted argument in both historical and theoretical contexts allowing her to build a case for the inclusion of appearance related criteria in our design metrics for measuring sustainability.

Prior to her explanation of the eleven tenants within her manifesto, Meyer categorizes the profession of landscape architecture into four distinct groups, each with varying interpretations and associated ideologies of sustainability’s role in practice. She recognizes the largest group to be those who embrace sustainability as “a technical challenge” for incorporating ecological processes in the urban fabric. In this instance, eco-technologies are evaluated primarily on their technical performance in reducing stormwater runoff through subsurface infiltration and evapotranspiration, increasing carbon sequestration rates, increasing energy savings to adjacent structures, and increasing air quality. While she expresses a great degree of approval for up and coming efforts such as the Sustainable Sites Initiative, she believes that “this type of work is not enough, especially if a designer’s hand is not legible, if our contributions are invisible infrastructure” (Meyer 2008, 13). As designers, we cannot settle for carving up or wasting valuable urban space for the inclusion of non-site specific eco-technologies taken from previous built works. Instead, we should look for opportunities to encapsulate meaning and experience through the selective integration of site appropriate eco-technologies into the ur-

ban fabric. This brings to light a certain inquiry in my mind as to how can stormwater infrastructure be designed in a way that is unique to a place in so much as it is perceivable to the everyday user?

Of the eleven tenants, several have introduced new ideas into my research. These include the emulation of natural process over natural form, the use of hyper-nature for greater emphasis of intended meaning, and the benefits of using the term “resiliency” over “sustainability” when referencing urban contexts. Meyer states in her fourth tenant that “natural-looking landscapes may not be sustainable in the long term, as they are often overlooked in metropolitan areas” (Meyer 2008, 16). In desiring to foster user ownership within South Grand’s right-of-way, I should be cognizant of the fact that the more structured a landscape’s form is in the urban context, the more likely people are to associate it with needed maintenance and continual upkeep. Meyer’s description of hyper-nature could enhance the conceptual design of adjacent parcels to urban rights-of-way. Finally, before reading this article, I referenced sustainability as the goal at the top of my theoretical framework; however, in light of her discussion concerning the dynamic nature of urban environments, I now believe that resiliency is a far better term for describing how a place can withstand any number of natural, economic, or social disasters.

- “Can landscape form and space indirectly, but more effectively, increase the sustainability of the bio-physical environment through the experiences it affords?” (Meyer 2008, 8).
- “Ecological mimicry is a component of sustainable landscape design, but the mimicry of natural processes is more important than the mimicry of natural forms” (Meyer 2008, 16).
- “In my experience, natural-looking designed landscapes quickly become invisible landscapes and neglected landscapes” (Meyer 2008, 17).

“Landscapes of Infrastructure”

Elizabeth Mossop | 2006

Throughout this article, Mossop argues for the importance of continuing the recent discourse surrounding landscape urbanism. “It offers the vehicle by which landscape architecture can reengage with citymaking and take a more political role in the debates surrounding urbanization, public policy, development, urban design, and environmental sustainability” (Mossop 2006, 165). She structures her argument by first defining landscape urbanism. Subsequently, she offers a historical accounting of the profession’s founding and its visionary role in large infrastructural projects such as Frederick Law Olmsted’s Central Park in New York City and Emerald Necklace in Boston. Since this time, landscape architecture has evolved into a profession divided by two polarizing schools of thought. One school focuses on McHargian planning, ecology, sustainability, science, and conservation, while the other focuses on art, design, and development. The unforeseen consequence of this division has resulted in the profession assuming a backseat role to architecture in the realm of urban design.

Mossop states that “while there has always been rhetoric calling for a unification of ecology and design, there have been few compelling solutions to urban problems exhibiting this fusion” (Mossop 2006, 167). With stormwater infrastructure reaching the end of its productive lifespan, landscape architects are poised to lead discussions that reintroduce ecological processes back into the urban fabric in a way that increases the aesthetic richness of our urban centers.

- “The discourse of landscape urbanism establishes the significance of infrastructure and its associated landscape in the development of contemporary urbanism, and in the generation of public space” (Mossop 2006, 165).

Appendix C

glossary

“Artful Rainwater Design” amenity: “a feature focused on the experience of stormwater in a way that increases the landscape’s attractiveness or value” (Echols and Pennypacker 2008, 270)

complete streets: multimodal, urban rights-of-way that are built and maintained to support safe and attractive environments with an equal level of service for all users (pedestrians, cyclists, commuters, motorists, etc.)

conventional streets: urban rights-of-way that are largely built and maintained for the basic functional transportation needs of the everyday motorist user

cost-benefit analysis: “an economic appraisal which attempts to evaluate all significant costs and benefits in a common unit of value” (Price 1978, 161)

destination streets: urban rights-of-way that use highly designed ecological processes through time to build and maintain a distinctive, district identity exemplified by a strong community of users and tremendous sense of place

dynamic user: a user who reaches a point in time when he/she assumes ownership of the urban right-of-way through a keen understanding of its ecological systems and his/her development of a personal land ethic toward maintaining and sustaining the installed eco-technologies

Ecological Urbanism: an interdisciplinary movement towards “city-making that is focused on the reintroduction of landscape elements and their continuity into the urban environment” (ASLA 2010)

Ecology: the essential, median level of user-orientation in which an urban right-of-way reintegrates natural processes into the urban fabric through eco-technologies that promote healthier environments and an improved quality of life for the users

eco-technologies: the practical applications of ecologically sensitive techniques, processes, activities, and/or structures into the existing urban fabric’s grey infrastructure

Function: the lowest level of user-orientation in which an urban right-of-way provides the most basic levels of service to users for their efficient movement from one point of reference to another

Genius Loci: the next to highest level of user-orientation in which an urban right-of-way uses ecological processes through time to engender its distinctive character and unique identity toward a community of users

green infrastructure: “interconnected natural systems and/or engineered systems that use plants and soil to slow, filter, and infiltrate runoff close to its source in a way that strengthens, mimics natural functions/processes” (Rosen 2010)

green streets: urban rights-of-way that are built and maintained to sustainably handle stormwater runoff, reduce fluvial peak flows, improve water quality, and enhance watershed health through the use of ecological process in the urban fabric

grey infrastructure: conventional, utilitarian-designed, “physical” structures and “systems that provide public services” (Grigg 2003, 2) such as utilities, sewers, stormwater runoff conveyance, and paved roadway surfaces

land ethic: a guiding philosophy that “the individual is a member of a community of interdependent parts” enlarged “to include soils, waters, plants, and animals” (Leopold 1966, 239)

Landscape Urbanism: an interdisciplinary movement that advocates for a paradigm “shift away from the discrete, architectural object as the primary organizing device of the city” (Fulton 2006, 51)

Meaning: the highest level of user-orientation in which an urban right-of-way cultivates educated “dynamic users” whom inherently take ownership of the public space and engage in actions that promote resiliency within the corridor

New Urbanism: “a movement in architecture and planning that advocates design-based strategies based on ‘traditional’ urban forms to help arrest suburban sprawl and inner-city decline and to build and rebuild neighborhoods, town, and cities” (Bohl 2000, 762)

resiliency: the ability of an urban right-of-way to indefinitely sustain its existence into the future overcoming any and all natural, social, and economic obstacles

resilient streets: urban rights-of-way capable of overcoming any and all natural, social, and economic disasters that are built and indefinitely maintained through time by its “dynamic users”

Safety: the next to lowest level of user-orientation in which an urban right-of-way promotes equal opportunity and experience through the health, safety, and welfare of all users

- **health:** aspects of landscape architecture that have beneficial, physical outcomes for users of sites

- **safety:** aspects of landscape architecture intended to limit or prevent accidental injury or death among users of buildings or sites
- **welfare:** aspects of landscape architecture that foster discernable, positive emotional responses among, or enable equal access by, all users of buildings or sites

sustainability: the concept of meeting present needs without compromising the ability of future generations to meet their own needs

urban right-of-way: “the total public strip of land within” a densely populated center/city “in which there is public control and common right of passage and within which all pavements and utility lines are located if possible” (Lynch and Hack 1984, 212)

users: “all those who interact with the place in any way: live in it, work in it, pass through it, repair it, control it, profit from it, suffer from it, even dream about it” (Lynch and Hack 1984, 67)

Appendix D

inventory maps

Throughout the site inventory and analysis phase of this project, several inventory maps were compiled from imagery tiles downloaded from an online database found at: <http://stlc.in.missouri.org/citydata/newdesign/index.cfm>. Figures D-1, D-2, and D-3 represent three of these maps that contain useful information specific to the neighborhoods surrounding the project site. Of particular interest, the parcel land values represented in Figure D-1 offer evidence of the correlation between parcel land value and demographic data. As one can observe, the project site clearly divides higher land values to the west from lower land values to the east. Referencing the demographic data presented within the user ethnicity analysis (see page 85) reveals a White population center to the west and a Black population center to the east. As a result, the design proposal for South Grand has the potential to bring a diversity of people together in a unique place grounded in equality.



Figure D-1: Inventory map of land values for the parcels surrounding the project site.
(<http://stlc.in.missouri.org/citydata/newdesign/index.cfm>)

- Institutional Preservation Area
- Neighborhood Commercial Area
- Neighborhood Development Area
- Neighborhood Preservation Area
- Opportunity Area
- Regional Commerce Area
- Recreational and Open Space
- Specialty Mixed Use Area

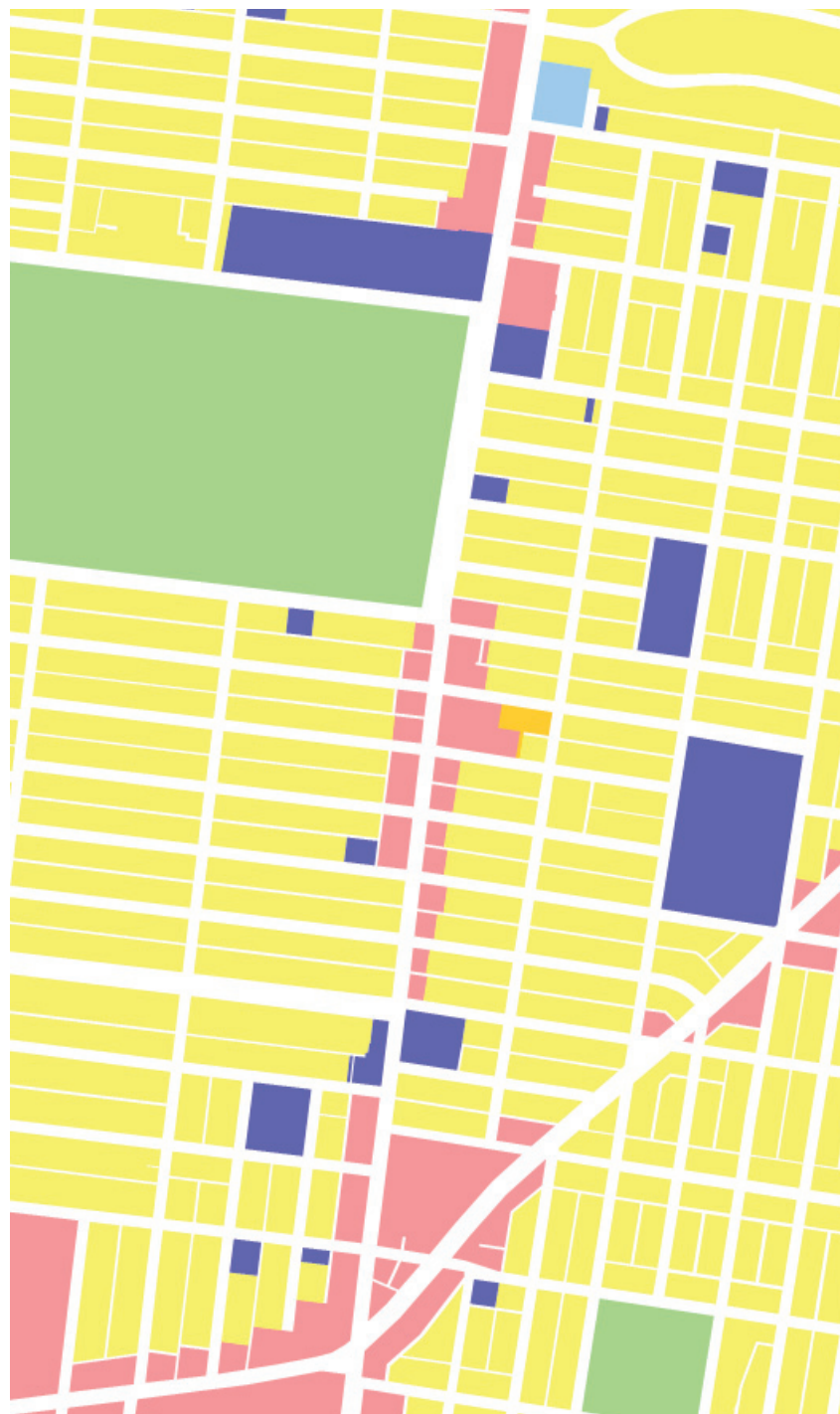


Figure D-2: Inventory map of land uses for the parcels surrounding the project site.
(<http://stlc.in.missouri.org/citydata/newdesign/index.cfm>)



Figure D-3: Inventory map of zoning for the parcels surrounding the project site.
(<http://stlc.in.missouri.org/citydata/newdesign/index.cfm>)

Appendix E

stormwater calculations

The discharge calculations for the hydrology analysis of existing and proposed site conditions pertain to a 20 year, 20 minute storm event (see page 77). Figure E-1 is included in this appendix to reference the P. I. factors used in the simplified rational method for calculating the estimated amount of stormwater runoff. The use of this calculation method, as well as, the selected storm event is a direct attempt to follow the same methods that Design Workshop previously implemented in their master plan for South Grand. In doing this, comparisons can be readily made between the total amount of stormwater runoff reduction in each proposal.

P.I. FACTOR IN CUBIC FEET PER SECOND PER ACRE

DURATION OF RAIN IN MINUTES	% IMPERVIOUS	15-YEAR RAINFALL FREQUENCY					20-YEAR RAINFALL FREQUENCY						
		15	20	30	60	90	120	15	20	30	60	90	120
		1.59	1.61	1.52	1.22	1.04	0.92	1.65	1.68	1.60	1.29	1.08	0.96
	0	1.70	1.70	1.59	1.27	1.08	0.95	1.76	1.78	1.68	1.34	1.11	0.99
	5	1.80	1.79	1.68	1.33	1.12	0.97	1.87	1.87	1.77	1.40	1.15	1.02
	10	1.91	1.89	1.76	1.38	1.15	1.00	1.98	1.97	1.85	1.45	1.19	1.05
	15	2.01	2.00	1.85	1.43	1.18	1.03	2.09	2.09	1.95	1.50	1.22	1.07
	20	2.12	2.09	1.92	1.49	1.22	1.06	2.20	2.18	2.03	1.56	1.26	1.10
	25	2.23	2.19	2.00	1.54	1.26	1.08	2.31	2.28	2.11	1.61	1.30	1.13
	30	2.33	2.28	2.09	1.58	1.29	1.11	2.42	2.38	2.20	1.66	1.33	1.16
	35	2.44	2.39	2.16	1.63	1.33	1.13	2.53	2.50	2.28	1.71	1.37	1.18
	40	2.54	2.48	2.26	1.69	1.37	1.16	2.64	2.59	2.38	1.78	1.41	1.22
	45	2.65	2.58	2.33	1.74	1.40	1.19	2.75	2.69	2.46	1.83	1.44	1.24
	50	2.76	2.67	2.41	1.79	1.43	1.22	2.86	2.78	2.54	1.88	1.48	1.27
	55	2.86	2.76	2.50	1.85	1.47	1.24	2.97	2.88	2.63	1.94	1.52	1.30
	60	2.97	2.88	2.57	1.90	1.51	1.27	3.08	3.00	2.71	1.99	1.56	1.33
	65	3.07	2.97	2.66	1.94	1.54	1.29	3.19	3.10	2.81	2.04	1.59	1.35
	70	3.18	3.06	2.74	2.00	1.58	1.32	3.30	3.19	2.89	2.10	1.63	1.38
	75	3.29	3.15	2.81	2.05	1.62	1.35	3.41	3.29	2.96	2.15	1.67	1.41
	80	3.39	3.24	2.90	2.10	1.65	1.38	3.52	3.38	3.06	2.21	1.70	1.44
	85	3.50	3.36	2.98	2.16	1.68	1.40	3.63	3.50	3.14	2.27	1.74	1.46
	90	3.60	3.45	3.07	2.21	1.72	1.43	3.74	3.60	3.24	2.32	1.78	1.50
	95	3.71	3.54	3.15	2.26	1.76	1.45	3.85	3.70	3.32	2.37	1.81	1.52
	100	5.30	4.60	3.70	2.40	1.86	1.53	5.50	4.80	3.90	2.52	1.92	1.60
	RAINFALL												

TABLE 1-2

P.I. VALUES FOR VARIOUS IMPERVIOUS CONDITIONS
(15 YEAR & 20 YEAR RAINFALL FREQUENCIES)

Appendix F

external communications

Unique to this project is the amount of external communication that took place throughout the initial project definition stage. Several documents are included in this appendix to highlight a few of these external communications. The first document is a letter addressed to Paul Hubbman, a representative of the client organization, asking for permission to use data from Design Workshop. The next document is an email sent to Bill Sullivan, Professor of Landscape Architecture at the University of Illinois, for his review of my work to date. His feedback is included in an email response on the following page. The final document is a letter that I received after contacting Emily Hauth at the Bureau of Environmental Services explaining the copyright permissions of imagery received from her via email. Opportunities, such as these, to network with other professionals throughout the duration of this research project have been a truly enriching experience.

1854 Claflin Rd., Apt. #6
Manhattan, KS 66502
15 October 2010

Mr. Paul Hubbman
East-West Gateway Council of Governments
One Memorial Drive, Suite 1600
St. Louis, MO 63103

Dear Mr. Hubbman:

Let me start by first introducing myself. My name is Jonathan Ryan. I am a graduate student in landscape architecture at Kansas State University. In my fifth-year of study, I have the opportunity to spend a year focused on one design/research project culminating in a Master's Report. For the last 7 months, I have lived and worked in New Orleans, LA. During my internship, I was heavily involved with a pilot streets project for the city. The goal of the project was to design 8 blocks of urban rights-of-way in the Lower 9th Ward in a way that would substantially reduce the amount of stormwater that the city was required to pump over the levees.

While studying and thinking about stormwater dilemmas in New Orleans, I began to think about the need for other cities, further upstream on the Mississippi River, to progressively begin pilot demonstration projects that address the potential for "green" infrastructure design in reducing stormwater quantities and improving water quality. Questions I have include the following:

- **How can natural systems be reintegrated into "conventional" stormwater conveyance and treatment processes in urban rights-of-way?**
- **How can we design performative urban landscapes that serve specific stormwater related functions and offer unique aesthetic, spatial and temporal qualities to a street?**

After reading about the *St. Louis Great Streets Initiative*, I began to think about how my research and ideas could be applied to one of its complete street demonstration projects. Being somewhat familiar with the Tower Grove Park area, I have come to the conclusion that the **6 blocks of South Grand from Arsenal St. to Utah St.** would be an ideal location for my research project. I have been inspired by the design proposals that Design Workshop is taking to "complete the street." I would like to further investigate how this could be a demonstration project for future stormwater infrastructure in the city of St. Louis.

Often times, students in my year are required to contact firms or organizations to acquire the base maps and information that are necessary to complete their design research project. I have contacted **Paul Squadrito** at Design Workshop to inquire about obtaining necessary information. He recently responded to me explaining that you think my project would be of great value to your organization. I am looking to find the following information:

- Base data materials that include a survey of the site in CAD format (to include the location of sewer pipes and catchment basins), a high resolution aerial, and specific GIS data to the project (particularly parcel data for area)
- Supporting information associated with site analysis and community stakeholder involvement
- Traffic analysis information (both before and after restriping pilot test)
- Hydrological data for site and context
- Your design program for the project
- Contextual and historical information on surrounding residential communities
- A 3D model of the project area (not crucial, but would greatly benefit my project)

I plan to use this information for the sole purpose of educational research in my Master's Project. I will not under any circumstance release the supplied information to the public without first your written consent. During the remainder of this school year, I will be analyzing the information given, culminating in a design for South Grand based upon my research. One of my end products will be the creation of a book summarizing the extent of my theoretical research, design proposals, and an evaluation of my design. I would be more than willing to present this document to you following the completion of my project.

Thank you for allowing me to use any information that you or Design Workshop is willing to grant access to. Should you need to reach me, please feel free to contact me at **636.295.6892** or **jmryan@ksu.edu**.

Sincerely yours,

Jonathan M. Ryan

Jonathan Ryan

From: Jonathan Ryan <jmryan@ksu.edu>
Sent: Wednesday, November 17, 2010 8:13 PM
To: 'William Sullivan'
Cc: 'Lorn Clement'; 'Stephanie Rolley'
Subject: RE: Jon Ryan's masters project
Attachments: jryan_mr_metric-wrkg_111110.pdf

Bill:

Let me start by introducing myself. My name is Jonathan Ryan. I am a graduate student in landscape architecture at Kansas State University. In my fifth-year of study, I have the opportunity to spend a year focused on one design/research project culminating in a Master's Report. **Lorn Clement**, my major professor, suggested that I contact you with a brief description of my project in order that you may propose additional readings and/or insight from your specific interests and ongoing research.

For my research project, I am studying the hierarchical categorization of urban rights-of-way according to increased levels of user orientation; because I want to understand how the reintegration of ecological processes into the urban fabric can act as a catalyst for **genius loci** and **user meaning** while mitigating downstream flooding, increasing water quality, and extending the lifespan of existing stormwater infrastructure. The goal of my research is to clearly articulate a new **theoretical framework** for expanding upon the current discourse surrounding "complete streets" and "green streets" theory.

Dilemma:

My research/design project looks to address a threefold dilemma. First, existing stormwater and combined sewer infrastructure is nearing the end of its productive lifespan in cities all across the country and world. Second, as evidenced in recent decades, flooding events along the Mississippi River are increasing in both frequency and intensity driving up the economic and environmental costs of ignoring natural processes. Finally, I believe that landscape architects, urban planners, and city officials are not progressing far enough to rethink systems and policies that could change the infrastructure model for the next hundred years of urban right-of-way design and construction.

Thesis:

Through the strategic fusion of ecological processes into the urban fabric, the design of South Grand Boulevard (located in St. Louis, MO) will present a **resilient** model for how "advanced infrastructure" design can transform urban rights-of-way toward "user-oriented environments."

I have attached a working graphic of the **theoretical framework** that I am proposing. In this framework, I present five categories (function, safety, ecology, genius loci, and meaning) that are respectively associated with higher levels of user orientation and thus resiliency. In much the same way that the psychologist Abraham Maslow presented his "Hierarchy of Human Needs" theory, I seek to present a new process for understanding the long-term resiliency of urban rights of way through a **Hierarchy of User-oriented Streets (see attached PDF)**.

I would appreciate any insight (including critical remarks) and/or literature that you think may be of use to my research. Thank you for taking a look at my work to date.

Sincerely,

Jonathan M. Ryan
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Jonathan Ryan

From: Sullivan, William <wcsulliv@illinois.edu>
Sent: Thursday, November 18, 2010 5:50 AM
To: Jonathan Ryan
Cc: Lorn Clement; Stephanie Rolley; Gale Fulton
Subject: Re: Jon Ryan's masters project

Dear Jon:

I appreciate the opportunity to read about your ideas here. You've carved out an important and large area for your thesis!

I have several responses, the most important of which is that you ought to be in touch with Gale Fulton who is on our faculty here at Illinois. Gale is thinking and writing a great deal along similar lines and has been working with a neighborhood in Champaign to convert their right-of-way (which used typical curbs and gutters with storm sewers) to a more ecologically friendly design. I've copied Gale on this message so you can see his email address above.

Professor Fulton has developed a website called Landscape Intelligence. There is some wonderful material on his site related to some of the questions you are raising. He's got a publication page there too along with a number of pdfs of articles that overlap with your ideas. You can see the publications at:

<http://www.landscapeintelligence.com/publications.html>

Just a comment or two on your diagram. First, I appreciate how comprehensive it is. I suggest you change the sentences under each of the major headings so that they don't ask yes or no questions. So for instance, instead of asking "Does the urban right-of-way ...?" I suggest you ask something like "To what extent does the urban right-of-way ...?" A yes or no question doesn't do justice to the complexity and variability of the issues you are asking here.

I find all the words inside the triangle to be a bit overwhelming. Perhaps you can explore removing those words and placing a caption beneath the diagram. That way, you can give describe the meaning of those ideas in a more space.

This is an ambitious project, one that is clearly necessary. I congratulate you and your professors for taking this on. I'll look forward to learning more about your progress.

Regards,
Bill

William Sullivan
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Date: December 10, 2010

To: Jonathan Ryan
Graduate Student, Landscape Architecture
Kansas State University
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